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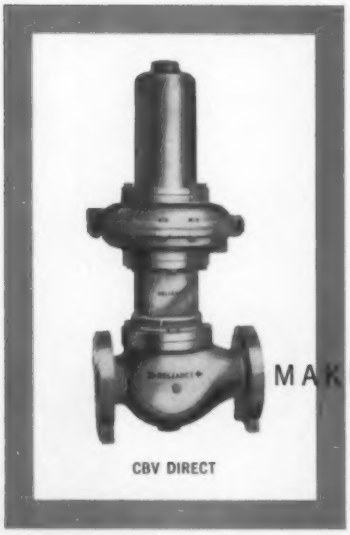

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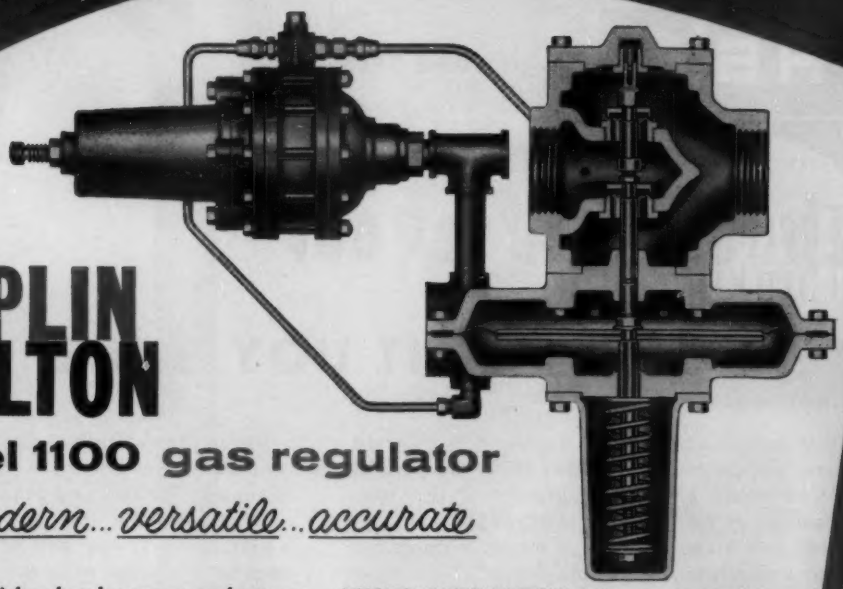

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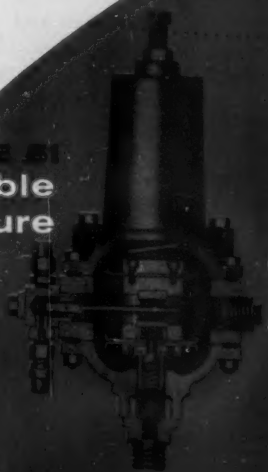

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JUNE 1958

Thermally Thinking

THE economic and cultural values of the United States are poorly understood. With the current tensions of world affairs, the gravity of this misunderstanding is vitally important.

But can you blame peoples of enemy nations for failing to understand the United States? I can't because friends of this country and even the American people themselves have cause to question their own understanding. This is both a great and good economic system as far as basic foundation is concerned. But our government, our lawmakers, and in many instances the people have certainly forgotten the basic principles of our economic system.

The impact of business laws, rules, regulations, taxes and the foul face of government in business are becoming even more obvious. This brings to mind socialism. And the next obvious question is, isn't the government trying to place capitalism and socialism into a juxtaposition?

It looks like this nation is in such a situation. If anyone can separate the capitalism from the socialism in the rules, regulations, taxes and red tape we have fouled ourselves with, I wish he would drop me a line and straighten me out. Maybe I am obstinate. Maybe the free thinkers have passed on by me. But, I can't figure out how you mix socialism with capitalism.

To tie it down with our industry, since the Phillips case, the Federal government has tried to regulate the field price of natural gas. They have made this attempt through the Federal Power Commission, which feels that control of these prices is impractical, even unworkable. The next move was to establish new laws, regulations or what have you that would extricate the industry from this situation. But such moves were to be fouled up individually as they went through the process of joining existing regulation and red tape.

Who knows what the next step will be. Under this system of socialism mixed in with surface capitalism, one can hazard the guess that as Federal control of natural gas field prices continues to kill investment incentive needed to explore for and produce gas, we can look for a change in the way of doing things.

Under the capitalism of our school days, the path would be clear. Return to the concept that pressures of supply, demand, and competition will equate equitable prices. But that is not modern "capitalism." No sir, the next step will be for the Federal government to move into exploration and drilling with the peoples' tax money.

The Memphis decision has done nothing to aid the ultimate consumer of natural gas. It has, in fact, periled his natural gas service by addition of more rules, regulations and red tape. I don't know what a student of classical civics would call it, but a system wherein a business has to secure a price increase by getting its customers to agree to it and then run to a Federal agency through complicated red tape that prevents the agency from even making an early decision, smacks of regulation for regulation's sake, socialism, with a touch of Townsendism thrown in.

The important point is, however, that by whatever name you call such Federal control as the gas industry has seen applied to it through the Phillips and Memphis decisions, it does not have the feel of capitalism. And capitalism is supposed to be the economic system of our United States.

Capitalism has been and will be important to the gas industry's progress. However, it goes even deeper than that. The relationship between our economic system and your human values is very important. The fruits of materialism are not the reason for your existence in the long run. The aspirations of man—moral values, aesthetic values, individual values—are of more lasting significance. Such human values do not do very well under Federal rules, regulations and red tape.

It is time for the American public to demand a return to our basic concepts of capitalism. Haven't we in the gas industry in particular had enough of this pseudo socialism mixed into the free enterprise system? Your voice and vote are the well springs for corrective action.

J. Fred Ebsen
EDITOR

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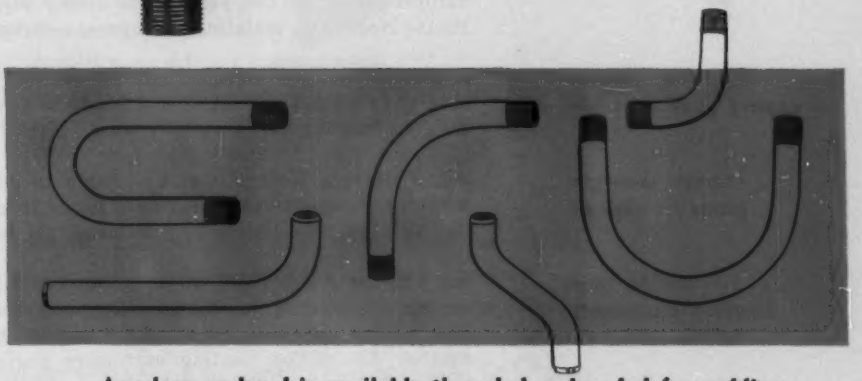

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GAS HIGHLIGHTS

Memphis roadblock about to crack

The gas industry is about to break loose from the temporary roadblock caused by the Memphis decision, and start on a full-scale expansion program. Several pipelines have reached agreement with their customers for price increases, as required by Memphis. A recent survey conducted by an engineering-consulting firm shows that at least 80 per cent of the gas companies contemplating major expansion this year are now ready to go ahead with plans. Reason: financiers, who shied away from gas projects right after the Memphis decision, now are ready to back expansion plans.

Automation frees men for "thinking"

Automation in the gas industry is freeing men for more creative engineering work, eliminating tedious manual operations, and freeing the engineer for a greater exercise of his "thinking" abilities, but "it isn't being used to replace manpower." Thirty-four top level participants in the *GAS* automation symposium held in New York May 7 were in unanimous agreement on this point.

New England studies plan to pool gas

Pooling of gas in New England may become a reality this year. It is now out of the talking and into the planning stage. A committee of utility men has been formed under the chairmanship of R. J. Rutherford, president of Worcester (Mass.) Gas Light Co. to iron out the details of the proposed scheme. Pooling would be modeled after power networks, permitting the use of most efficient plants and diverting larger allocations of natural gas to areas not well equipped to make gas.

Portland Gas buys system in Eugene

Portland (Ore.) Gas & Coke Co. will acquire the Eugene (Ore.) system from Cascade Natural Gas Corp. for a price in excess of $300,000. Presently a propane-air system, Portland Gas intends to convert Eugene to natural gas within two years. A $6 million pipeline must be built from the Pacific Northwest mainline to Eugene, a distance of 120 miles.

Liquefied natural export plan dropped

A plan to transport liquefied natural gas to Great Britain has apparently been abandoned. Constock Liquid Methane Corp. withdrew its filings with the FPC, saying only that they were "premature."

South Georgia plans to expand

South Georgia Natural Gas Co. wants to double its size. It has asked FPC for permission to extend its pipeline from Albany, Ga. to Burnswick, Ga. New line would serve 17 new municipal systems, and four industrials.

1.1 million new heating customers

Gas utilities added 1,194,000 new househeating customers last year, AGA reports. Number of gas-heated homes was increased 7.1 per cent to total 17.9 million in 1957. AGA estimates that the gas industry will gain another 3.6 million heating customers during next three seasons—2.2 million will be new homes, 1.4 million will be existing dwellings.

New pipeline rumored for West

Rumors of another new pipeline to California have been heard in the Southwest. Tentatively called Gulf-Pacific Gas Co., the line reportedly will run from Louisiana's Bastian bay in Plaquemines parish to Yuma, Arizona. Customers as yet are unknown.

Computer saves $40,000 for utility

A joint working agreement is paying off for New England utilities. The network analyzer which 17 Massachusetts utilities have installed at Tufts University is already paying dividends. New Bedford Gas & Electric, for example, might have spent $50,000 on main construction had it not consulted the computer, which came forth with a $10,000 solution instead.

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Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

The malignant Memphis case

ALL friends of the gas industry know about the dreadful "Memphis" disease which was contracted late in 1957. Few, however, know the extent of its malignant penetration. The law doctors will not know what action to take until the results of the laboratory tests come from the United States Supreme Court early in 1959. While we are waiting, the natural gas pipeline companies in the nation are accumulating the liability to refund money at the rate of $18 million a month. In addition, pipeline companies in recent years have collected more than $200 million annually in rate increases which would have to be returned in cash.

Chairman Kuykendall of the Federal Power Commission aptly described the *Memphis* case when he stated:

"This decision completely overturned the established procedure which the entire natural gas industry, consumer interests, and the Federal Power Commission had thought, and the Federal Courts had assumed, was provided by section 4 of the Natural Gas Act. If this decision stands, a pipeline company cannot file a new rate even if the purchaser has agreed that this might be done. Under this decision, a different rate can be filed and become effective only if the purchaser has agreed in advance to the particular rate which is to be filed, or the Federal Power Commission has, under section 5 of the Natural Gas Act, completed an investigation and hearing, and issued an appropriate order."

• Implications of decision

In view of the grave implications of the Memphis decision on the rate-making process, FPC will continue to administer the Natural Gas Act as it has for 18 years, and accept rate changes in tariff form under section 4 of the Act. FPC is currently requiring pipeline companies to furnish a bond for the entire amount of the rate increase to cover a possible refund in cash. The Court of Appeals decision in the Memphis case is not binding on FPC until that court sends a mandate to the commission. That mandate will not be issued until the Supreme Court has made a final disposition of the case, which is expected in January 1959.

There are indirect effects flowing from the present uncertainties which are significant. Some gas distribution companies have changed their plans for expansion, because the interstate pipeline companies are uncertain about the future. Orders for new pipe, compressors, and equipment and security issues have been cancelled or postponed. This is sad news at a time when anti-recession construction is needed.

Some pipelines are trying to obtain customer assent to specific rate increases at stated intervals, but giving the customer the usual right to contest the rate change in FPC hearings. This method, however, has received customer resistance for agreements covering more than two or three years. Such a method gives a short breathing time before the pipeline company will have the problem of how to obtain adequate revenues to meet continually rising costs.

FPC is disturbed by the administrative burden it would assume in supervising the rates of the large and complicated pipeline industry, if contract rates are required by the Memphis case to be substituted for the present uniform gas tariffs.

At the present time, FPC has pending 53 rate increase cases started by 34 pipeline companies, which involve gross revenue increases of about $226 million a year. The effect of the Memphis decision on current operations of natural gas pipeline companies, faced with the possibility of refunding all of these collections in cash, is indeed serious. The annual gross revenue of the 34 pipeline companies in this predicament was $1.3 billion, so that the refunds of the group could be a sixth or more of their entire revenue for one year. Any refunds of that magnitude would have a severe impact upon the individual companies, and upon the whole pipeline segment of the gas industry. The future natural gas supplies which distribution companies are seeking would be delayed in discovery, development and delivery, because of the financial set-back from the effects of the Memphis decision, if the Supreme Court affirms it.

• Customer consents

Some pipeline companies obtained customer agreement to specific new gas rates before and after the Memphis decision. There is, however, little economic incentive for a customer company to agree to pay a higher price to a pipeline for gas if it is satisfied with the quantity received. When market requirements of a customer company are growing, it must ask the pipeline company to supply more gas for those needs, and then

it may be forced to agree to a higher price for gas. Experience shows that expansion of facilities and natural gas supplies to meet customer demands usually encounters higher costs for labor, materials and gas purchased from producers. Not only are construction costs higher year after year, but the sales of new natural gas supplies by producers have been consistently at higher prices.

Under the present section 4 procedure for gas rate changes, both the pipelines and the customers are protected when a company is expanding. The pipelines have invested in new facilities, incurred more operating expenses and filed rate increases which they consider necessary. The pipeline companies are assured that after a five-month suspension period the new rates will become effective subject to FPC review. FPC has taken time for critical and objective analysis of the complex problems presented, and has given assurance to gas customers that they would not be required to pay rates which were found to be unreasonable.

• Single standard for rate-making

Generally speaking, FPC has a single not a double standard for making gas rates, whether Section 4 or 5 of the Natural Gas Act is utilized. A natural gas company can minimize its transitional financial loss to six months by increasing rates under section 4. Then upon FPC's final decision rates are made retroactively. Under section 5, by contrast, it may take years to get rate relief because that procedure is prospective only. Such regulatory lag is familiar in state regulation of utilities. The single standard used by FPC to make rates for all gas pipeline companies produces gross revenues sufficient to cover operating expenses, depreciation, taxes and return. The fair return is the amount permitted to be earned on the depreciated original cost of property used in rendering the gas service. The dollars for return are to meet the financial obligations on bonds and preferred stock, and to provide common stockholder earnings comparable to those in enterprises having similar risks.

• Public interest in rate schedules

The Federal Power Commission recently gave cogent reasons for its procedure governing gas rate changes. FPC stated:

"The reasons which led the commission to adopt Order No. 144 and require pipelines to use rate schedules in tariff form rather than the private contracts previously in vogue are even more valid today than they were in 1948 when that order was adopted. The use of rate schedules conforms to historically effective practices, agrees with pricing methods followed by regulated industries generally and is consistent with organic regulatory statutes on a Federal and State level. Moreover, it follows the practice under the Interstate Commerce Act, from which the rate provisions of the Natural Gas Act were taken. It affords better protection to consumers in both old and new service than can be achieved if hundreds of separate customer contracts are used as a substitute and it substantially reduces the administrative burden. The use of tariff forms is a necessity to avoid successfully the risk of unjust discrimination, preference or prejudice outlawed by the Acts we administer.

"Experience has shown that in practical operation, the paramount interest of consumers in low reasonable rates for natural gas has been promoted by (a) generally applicable pipeline tariffs and (b) commission review of rate changes pursuant to the Section 4(e) process, during the current era of rising prices and rising cost-of-service." * * *

"With tariffs, the general and specific responsibilities of the commission in reviewing rates are greatly simplified. Industry-wide, we find that about 100 tariffs efficiently replace many thousands of separate gas contracts. In any given case of rate review, the provisions of one tariff rather than many contracts are the basis for determination of just, reasonable and non-discriminatory rates. Consequently, we would fully expect administrative costs to increase materially if tariff schedules must be established only by the commission under Section 5(a) and that the administrative delays, especially in the adjustment period, will be material. These difficulties would in large part cast further burdens upon the consumers and be of no advantage except to those pipelines fortunate enough to secure customer assent to rates which were placed in effect and later found by the commission in a Section 5(a) proceeding to be excessive, for the commission could not then require a refund.

"In certificating the service of distribution areas requiring specified quantities of natural gas for residential and other use, the commission, in the protection of consumer and investor interests, insists upon evidence that the applicant pipeline will have an adequate gas supply for a long enough period of time to return some of the distribution property costs—usually 20 years or more. Gas supply contracts with distribution customers entered into by pipelines, therefore, must be and are long-term as to quantities and service conditions, but not as to price.

"Under present standard practice, these schedules have established an initial price, leaving future prices to be fixed by the future 'effective' tariffs of the pipeline as its costs may change. Under the Memphis rule, and absent customer agreement to each specific rate increase at the time it is proposed, pipelines might be under the compulsion of trying to fix at the outset firm future prices for the entire term of each contract." ■

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Unitrol 110—the standard of the water heater industry... more than 3,000,000 controls produced and sold with less than one-half of one percent returns.

TR Wall Thermostat—dependable comfort control for the home ..."fashion-right at home" in any decor!

FAL 400 Fan & Limit Control—Compact, easy to install... Fan & Limit Control settings adjustable.

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Robertshaw-Fulton CONTROLS COMPANY

GRAYSON CONTROLS DIVISION, LONG BEACH, CALIFORNIA

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WITH NEW IMPORTANT FEATURES!

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The Ottawa Truck-Mounted Backhoe is designed to meet the need of public utilities, plumbers and contractors for a COMPLETELY MOBILE DIGGER! It's an UNBEATABLE COMBINATION for

MUSCLE! The powerful hydraulic system of the Ottawa "Big Muscle" Backhoe provides EXTRA POWER for fast, smooth, economical operation!

MOBILITY! Use it anywhere, anytime . . . one job or several jobs at different locations during one day! The Ottawa WORKING UNIT is also the MOBILE UNIT ready to move anywhere with great roadability, ready for operation seconds after arrival at a new jobsite!

VERSATILITY! Dig trenches and ditches faster . . . load dirt direct from trench to truck . . . dig square graves that need no hand finishing . . . dig and maintain irrigation channels . . . clean roadside drainage ditches . . . dig building footings and septic tanks . . . use as a boom to lay lightweight pipe . . . the Ottawa Backhoe is COMPLETELY MOBILE to your needs!

Ottawa

OTTAWA STEEL DIVISION
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BUY the Ottawa BACKHOE and the Chevrolet TRUCK! GET the BEST BENEFITS of each . . . PLUS . . . the NEW, DYNAMIC ADVANTAGES of the COMBINATION TRUCK-BACKHOE!

AVAILABLE ONLY AT YOUR CHEVROLET TRUCK DEALERS!

TECHNICAL TRENDS

By GUY CORFIELD

The National Fire Protection Association

The NFPA was organized in 1896 "to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects, and to secure the co-operation of its members and the public in establishing proper safeguards against loss of life and property by fire." In addition to some 200 national and regional organization members, it has 17,000 associate members including individuals and various interested groups.

NFPA has two functions: One is to make the standards under guidance of which the fire waste may be checked; the other is to educate the people in the observance of these standards and point out the penalties for ignoring them.

This work is done through the *Proceedings* of annual meetings; sponsorship of Fire Prevention Week, spring cleanup, etc.; various publications; and activities of some 100 technical committee which develop s t a n d a r d s . Committee members represent general public interest, public authority, property owners, insurance, commercial interests in equipment or products, and technical experts. One of the best known standards is the National Electric Code, which is constantly being reviewed and revised by the NEC committee which is itself divided into 17 panels.

The gas industry is represented on the air conditioning committee by C. George Segeler of AGA headquarters; on the gases committee by Segeler, and C. C. Westmoreland of Southern California Gas Co.; on the internal combustion committee by I. E. Rowe of United Gas Corp.; and on the ovens and furnaces, and chimneys and heating equipment committees, by Segeler. A complete list, and prices of the Standards can be obtained by writing to the NFPA, 60 Batterymarch Street, Boston 10. Mass.

Technical Education, and Serendipity

A recent trend in technical education, led by such institutions as MIT, Caltech and Case, is toward the turning out of scientists rather than specialized or industry-directed engineers. It is reasoned that today's problems of varied, uncharted and frequently unconventional technology require a strong background in physics and mathematics and other basic sciences. The top flight engineer must be more of a research man than an operator. He must be tuned to "imagineering" rather than production engineering. To more fully serve his country in the present era of international competition, he must be equipped for *pioneering* in the realms of electronics, nucleonics, super-materials and super-fuels.

What the engineering schools are developing is the continuation of general courses in physics, mathematics and basic engineering through the regular four undergraduate years, rather than teaching industrial applications in the third and fourth years. Some are requiring a fifth undergraduate year because they think the students have not learned enough in high school. Post graduate study is encouraged so that more "pure" science can be absorbed. It would thus seem that, in an unpublicized manner, there is a growing response to the public clamor for "better" engineers and scientists. Actually they will not be better but, rather, re-oriented.

It is realized that such a program will present problems. For one thing, it will put a greater burden on industry for on-the-job training, as graduates will not be so tailor-made for production work. It will be more demanding on the colleges which are already overtaxed. It will subject the students to more homework, and to more classroom study because the shop and vocational laboratory courses will be reduced. It is believed, however, that the results will be worth the greater effort. It is expected that the "new" engineer will have less specific knowledge but will be generally better educated than previous graduates. He will be better able to adapt to a new situation. He will be more willing to disregard, or at least not be mentally blocked by former concepts. For instance he may not be apprehensive of seeming obstacles like the sound "barrier" which is now penetrated with relative ease; nor shocked by the serious study that is now being given to the circumvention of the "law" of gravity.

This new engineer may even be more attuned to the possibilities of *serendipity* — a term which has been applied to the gift or circumstance of making a happy or unexpected discovery by accident. Many such have been made, in various fields. A classic example was the "discovery" of bacteria by Pasteur. Bakelite was synthesized by accident, and so was saccharine. Equally important as the accident was the inquisitive follow-through to find an explanation and realize its potentiality. It is thought, however, that serendipity is not entirely accidental. The discovery may be unrelated to the specific research in progress, or it might even result from a routine job such as cleaning or dismantling apparatus. But it has usually happened to a particular type of person who has thorough training, an inquisitive or prepared mind and an intense interest in his work or related work. A technical or scientific "breakthrough"—to use a modern term—could just as well come through serendipity as from planned research. ■

unique combination

Only cast iron offers you long life, dependability and long term economy.
Look at the record: Hundreds of American gas companies are still using cast iron mains laid fifty and more years ago. Fifty five of these companies can point to mains with more than a century of service behind them.
Add the fact that today, modernized cast iron pipe, centrifugally cast, is even stronger, tougher, more uniform.
The conclusion is clear:
Cast Iron pipe will serve you longer than any other pipe.

Service is Built Into Cast Iron

- Standardized mechanical joints are bottle-tight for usual gas distribution pressures... and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortages. Cast Iron Pipe is immediately available.

U.S. cast iron PIPE

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

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A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

This sturdy Rockwell "150" meter weighs only 12 lbs. yet delivers a full rated capacity of 150 cfh. Even the largest of the four domestic sizes—the "415"—weighs under 20 lbs.

LIGHT... *easy to handle*

Lighter and Smaller Rockwell aluminum meters can make your installations easier, warehousing and trucking less burdensome and costly.

But that's only part of the story. You'll find a world of difference in performance. And you'll get quality that's just not obtainable in bulky old style meters.

For example, all Rockwell aluminum meters have oil-impregnated powdered bronze bushings at every bearing point. Valves are of lightweight, long wearing Bakelite; diaphragms are costly imported sheepskin (synthetic optional). You'll appreciate the safety of a strong one-piece bowl type body and the single joint construction to minimize leakage risks. Servicing is simplified, too, by an exclusive Rockwell feature that's become almost a trade mark. It's the removable and interchangeable valve plate to which all working parts are attached. Write for bulletin.

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TODAY the world is undergoing a technical upsurge unequalled in history. You can see it all around you. The miracles of yesterday are now commonplace. Many of the dreams for tomorrow are past the blueprint stage.

We at Rockwell have embraced this technological challenge with the largest

RESEARCH

Creates the new and useful...
Anticipates your needs for today—and tomorrow

research and development program in company history. A major share of our research is, of course, devoted to our present products and product lines. Such work is conducted in completely staffed and equipped laboratories at every plant level. The aims and objectives of each are guided by a Central Research and Development Center at company headquarters. Pure research is also conducted at this Center and through Fellowships which we maintain at leading institutes and universities.

From all this comes a steady flow of product improvements and, of course, pioneering achievements. Over the years Rockwell has been the leader in creating the new and useful, in filling the needs and desires of the gas industry for better performing equipment.

Our huge reservoir of technical facilities, talent and experience is dedicated to developing products that will benefit you in the years to come. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

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ROCKWELL GAS METERS AND REGULATORS

how do YOU handle

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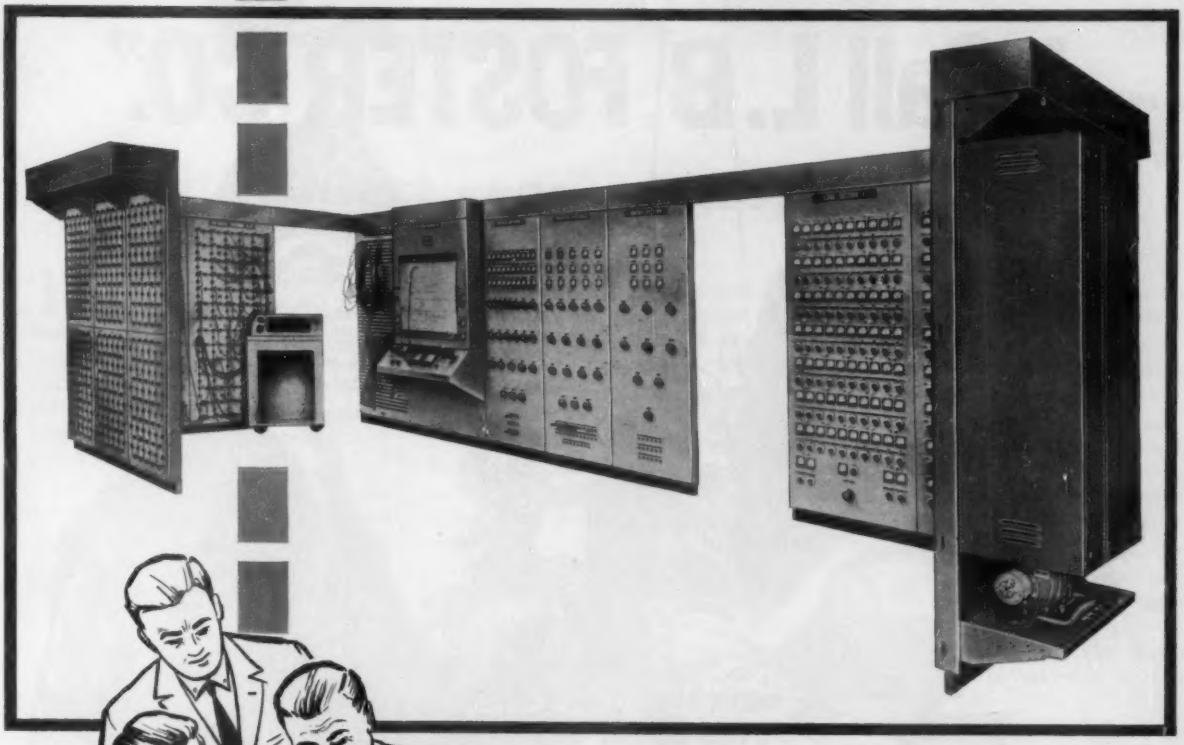

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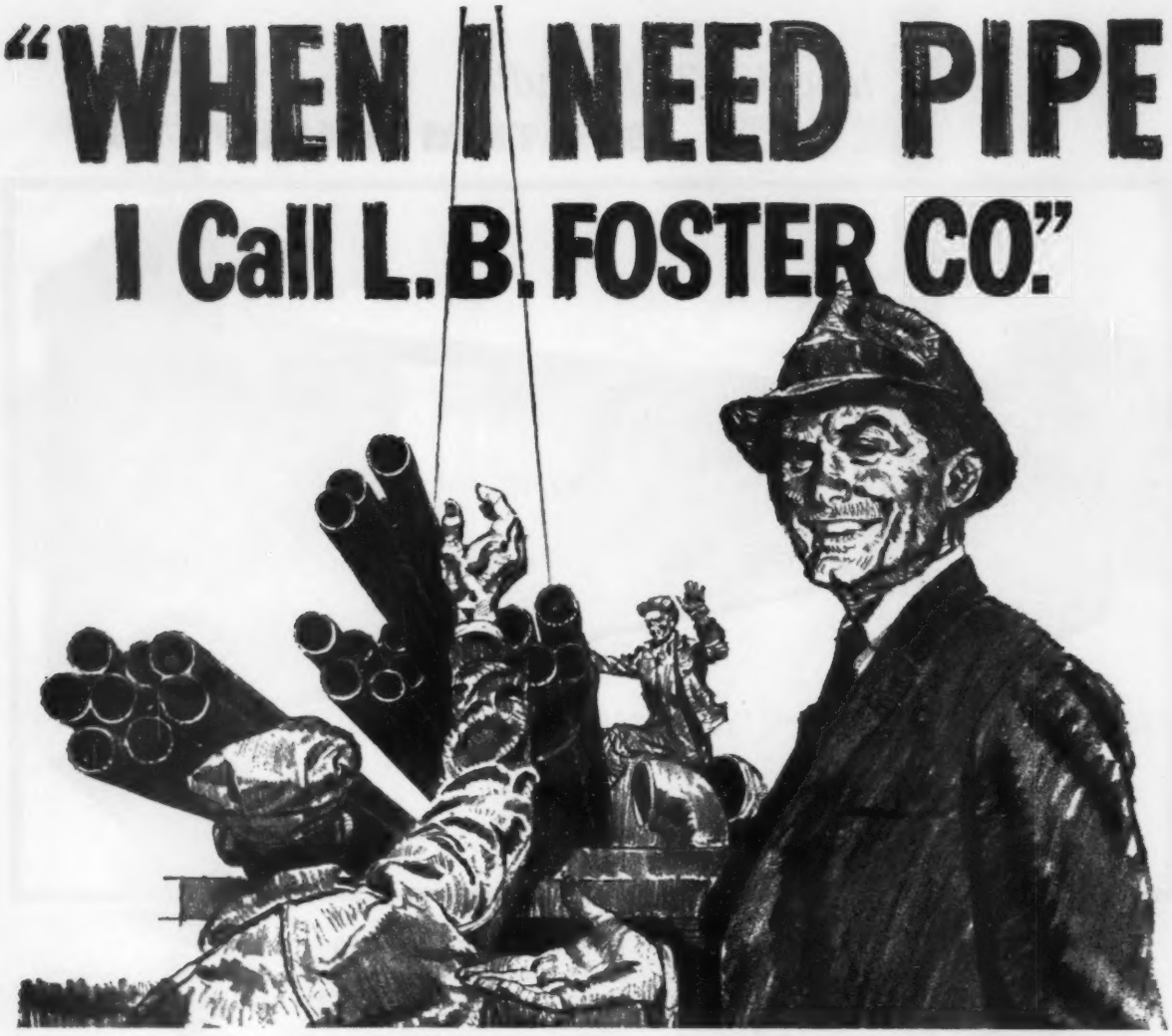

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Yes... regardless of how much pipe you need... or what kind of special pipe, or unusually-large size... it's a good bet you'll find most of the items in Foster warehouse stocks. And it's also a sure bet you'll get immediate and dependable service. For service is a specialty at L. B. Foster Company . . . especially on the hard-to-get items.

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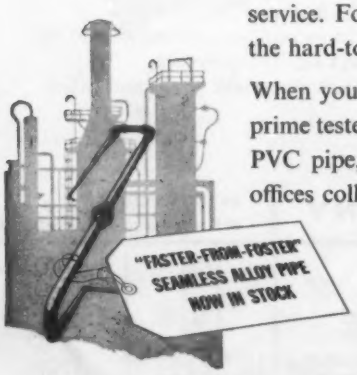

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WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

"Wait 'til next year" atmosphere prevails

THE mid-point in the gas industry's expected "big year in Washington" has slipped quietly by. It was marked only by gloom, dejection, and a growing awareness that the Federal Power Commission may hold its unwanted regulatory power for a long time.

Gas industry legal eagles are quietly but firmly beginning to operate on the theory that natural gas legislation, reversal of the Memphis case, or any other congressional or court lifting of gas industry regulation is becoming unlikely, at least for some time.

Few industry spokesmen—the lawyers least of all—are openly admitting defeat. There's some Dodger-type "wait 'til next year" talk.

The industry fighters are pointing out that 1959 will not be an election year, and thus will be a better bet for passage of the gas bill than 1958 would have been anyway. They also point out that when a new gas bill is introduced next year, the coal amendment can be written into the bill originally, and some valuable time saved.

This is the amendment negotiated this year, in return for support by the coal industry for the Harris-O'Hara bill, which would prohibit socalled dump sales to industry by pipelines. It was not popular with the pipelines, but was approved by most of the rest of the gas industry.

They may well be right.

Next year may be the year gas legislation will pass, the Supreme Court will overturn the Memphis decision, and the Washington Senators will win a major league pennant.

But there's a psychology of unpassed legislation just as there's a psychology of cellar baseball. Losing ball clubs have a tough time fighting their way out of the tag end of the league—and with few exceptions, don't make it.

Similarly, legislation that's been kicking around the circuit as long as the gas bill loses lots of luster each year. And with some good reasons.

In the past few years, gas legislation has been vetoed twice. It's been killed twice by the devastating effects of well-intentioned but badly misconceived actions of overeager friends of the legislation. The bill stands now where it did in January.

The original claim that the gas industry desperately needs the legislation, no matter how valid, tarnishes a little more each year. Even though the legislation doesn't pass, the gas industry continues to rack up good earnings. How can things be as bad as they're painted, on-the-fence congressmen wonder.

When it comes to the Memphis case, there is even less to cheer those praying for its reversal. Past history of the U. S. Supreme Court decisions in similar cases isn't encouraging. Because economics make it necessary, the gas industry is going to find a way to live with it, at least until next winter—the earliest it could possibly be overturned.

The high court in recent years has shown considerable disposition to look at the social and economic facts, in addition to the legal arguments, of the cases it considers. After the initial flurry of pipeline expansion cancellations, the industry now shows signs of going ahead in spite of the ruling—a fact the Court may well consider.

Legislation to upset the ruling next year would face a tough fight.

Gas industry lawyers in Washington are treading an extremely thin line when it comes to fighting cases before the FPC in which the Memphis decision is a factor.

Those that have successfully won cases in spite of the decision have this advice for their legal colleagues:

* Operate as though the Memphis case will be affirmed by the Supreme Court.

* In making your case for rate increase filings, go back to private deals. Don't force the commission to follow the Memphis case and thus set precedent. Lay the case so the FPC won't set precedent no matter which way the Supreme Court decides.

At least two firms (Texas Gas and Southern Natural) have won increases in spite of the Memphis case. In both instances, the higher rates were agreed to by most of the customers involved.

As the noose of forced regulation of the gas industry continues to tighten, the Federal Power Commission will for the time being become the major battleground for producers and pipeline.

A new proposal for a 1305-mile gas pipeline from West Texas and the Texas Panhandle to serve the lush California gas market is promising to become the newest in a long list of bitter battles at the commission.

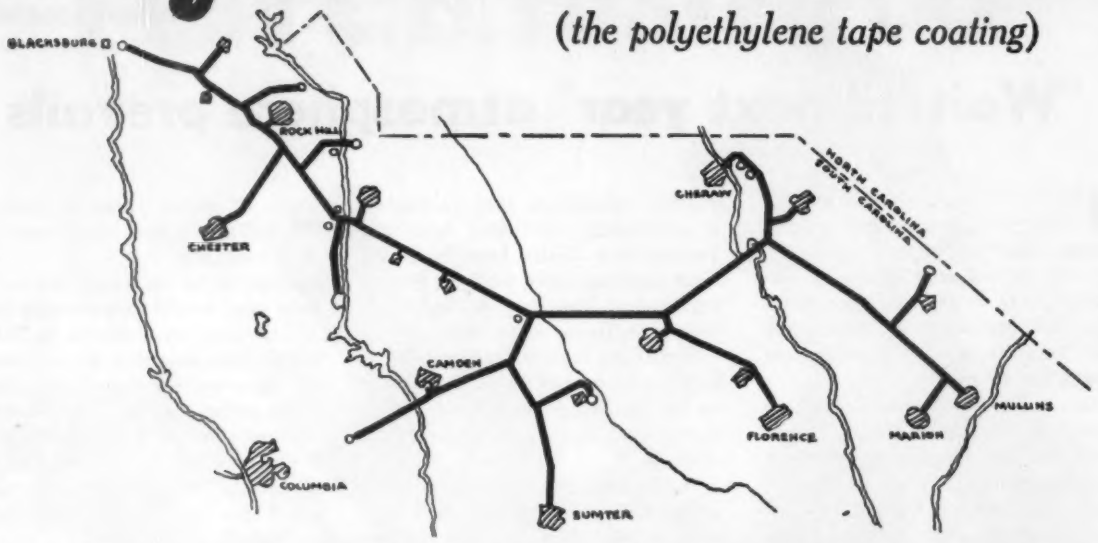
The proposed line, promoted by a new company, Transwestern

Continued on page 132

New Carolina pipeline chooses

Polyken® Protection

(the polyethylene tape coating)



Carolina Pipeline Company, Inc., selects Polyken tape for its proven dependability . . . plus construction savings in time, labor and handling costs

Fewer delays with Polyken

Pipe can be lowered directly into the ditch after being wrapped. (Scene near Rock Hill, S.C.)

Combination cleaning and wrapping

Clean pipe is ready to be wrapped immediately. No wasted manpower here.

The Carolina pipeline system—serving ¼ of the entire state of South Carolina—will bring natural gas to one of the most important industrial regions of the South.

Polyken polyethylene tape was chosen as the coating for this system because it's proven.

Pipeline operators have seen how polyethylene stands up to the corrosive combination of moisture, soil chemicals and electrolytic current.

And contractors have found that The Polyken Method provides cost-cutting advantages like these:

1. **Substantial labor and equipment savings because of simplified operation.**
2. **Faster construction—consistent high daily output.**
3. **No hot dope preparation—tape is always ready.**
4. **No drying or cooling time. Simple clean-wrap-and-lower operation makes for a tight spread and closer supervision.**
5. **Vastly reduced warehousing, shipping, handling costs.**
6. **Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.**
7. **Wrap goes into ground in factory-uniform condition.**

If you would like to know more about this time-saving, time-tested coating, contact Polyken Sales Division, Dept. OG4, 309 W. Jackson Blvd., Chicago 6, Ill.

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Experienced in modern PROTECTIVE COATING

THE KENDALL COMPANY
Polyken Sales Division

Edited by MARSHALL E. PARKER

A coating evaluation testing Program

E. R. Allen, Jr.
Humble Pipe Line Co.

FOR the past 10 years, Humble Pipe Line Co. has been carrying on a comprehensive pipe coating evaluation program. The basic idea of a good coating has been that it is one which has, and can maintain under service conditions, high electrical resistance and relative freedom from holidays. Laboratory tests in vogue at the start of this program are criticized on three counts; reliability, relevance, and validity. Some tests, in other words, were subject to errors; others merely measured properties which, in themselves, had little or nothing to do with performance; while still others correlated poorly with field experience. This latter requirement is of top importance.

The overall program involved three successive phases: (1) the accumulation of field experience on existing coatings, in classified environments; (2) the development of a battery of tests, application of these tests to the coatings examined in the field, and correlation of test results with experience; and (3) the application of the test battery to new coating materials.

The battery adopted consists of tests for these characteristics:

1. Electrical resistance
2. Water absorption
3. Resistance to deformation by pressure
4. Resistance to damage by impact
5. Resistance to cracking by bending
6. Adhesion to pipe
7. Resistance to soil environment
8. Resistance to petroleum oils
9. Resistance to damage by cathodic protection

All of the tests are performed on 18-in. lengths of 4-in. pipe, on complete coating systems. It is the intention in each test to measure just one isolated characteristic, with all the relevant conditions held constant. The following covers only a part of the tests.

Resistance to deformation under pressure. This property is tested by applying a ½-in. radius hemisphere under a steady 25-lb load at a constant temperature of 77°F. The penetration is plotted against time, being expressed as a percentage of the total coating system thickness. This test has been found to be of very great value when comparing different systems of reinforcing, outer wrap, and the like, of conventional hot-applied enamels. It is not very useful on thin coatings.

Resistance to damage by impact was tested by dropping a point similar to the one used above, but carrying a 10-lb weight, from increasing heights. This test has been discontinued, as it indicated only gross differences in coatings.

Adhesion to pipe. Two primed discs are bonded with a specified thickness of molten enamel. They are then tested to failure by the application of an increasing series of tensile impacts perpendicular to the faces of the discs. This test has proved very useful, particularly in the evaluation of primers and primer-enamel combinations. It is not applicable to tapes.

Resistance to soil environment has been tested in several ways. One of the damaging effects of this environment is that caused by the shrinking and swelling of soils under wet and dry conditions, commonly referred to as soil stress damage. This is being tested under controlled conditions, but the tests have not been under way long enough for precise evaluation.

The same is true of a test designed to promote the development of coating attack by micro-organisms such as may live in well aerated soils. A mixture of topsoil, peat moss, manure, agricultural lime, and ammonium sulfate is being used as a backfill.

Resistance to petroleum oils. Several versions of this test have been tried; some difficulty has been experienced in getting good correlation with field results. An example was a very successful performance of one of the early tape coatings, followed by very poor performance in actual service. It turned out that the lack of soil stress in the laboratory test was the difficulty; the adhesive was softened by oil, but, in the absence of stress, no failure occurred. Present version of the test is simple and quite severe, requiring elaboration in the field.

Resistance to damage by cathodic protection is tested by observing the increase (if any) in current demand under cathodic protection. Tests are run at different potentials, and are made both on perfect specimens and on those containing artificial holidays. No coating is considered satisfactory in performance unless tests have been passed on specimens with holidays.

Field tests, to establish correlation and as more definitive tests on coatings which have been laboratory approved, consist of inspections, Pearson surveys, conductance measurements, and cathodic protection current requirement determinations. It is pointed out that the last two must be used with great caution in comparing different coatings, because of the large role played by the soil in the effective values obtained.

General conclusions are: (1) field data alone are too slow, and, because of the impossibility of controlling all the variables, too difficult to interpret; (2) laboratory data alone are not wholly reliable, but can be depended upon to weed out the grossly unfit; (3) testing is most difficult on new and untried products, which is where it is needed most. ■

Abstract of paper presented at 14th annual conference, National Association of Corrosion Engineers, San Francisco, March 16-21, 1958.

12" Mechanical Joint Cast Iron Pipe
for gas main in New Jersey.

CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe,
Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

MECHANICAL JOINT cast iron

cast iron... the pipe with 'built-in' insurance

its dependability is proved... not promised

With cast iron pipe you get more than metal. Every length carries with it the definite, if unwritten, promise of dependability and long life.

The record proves it. Cast iron gas mains installed by 57 American gas companies over a century ago are still serving. Mains with fifty and more years of service are common. Best of all, *modern* cast iron pipe, centrifugally cast, is even tougher and stronger.

Specify cast iron and be sure. Your mains will, literally, "wear like iron."

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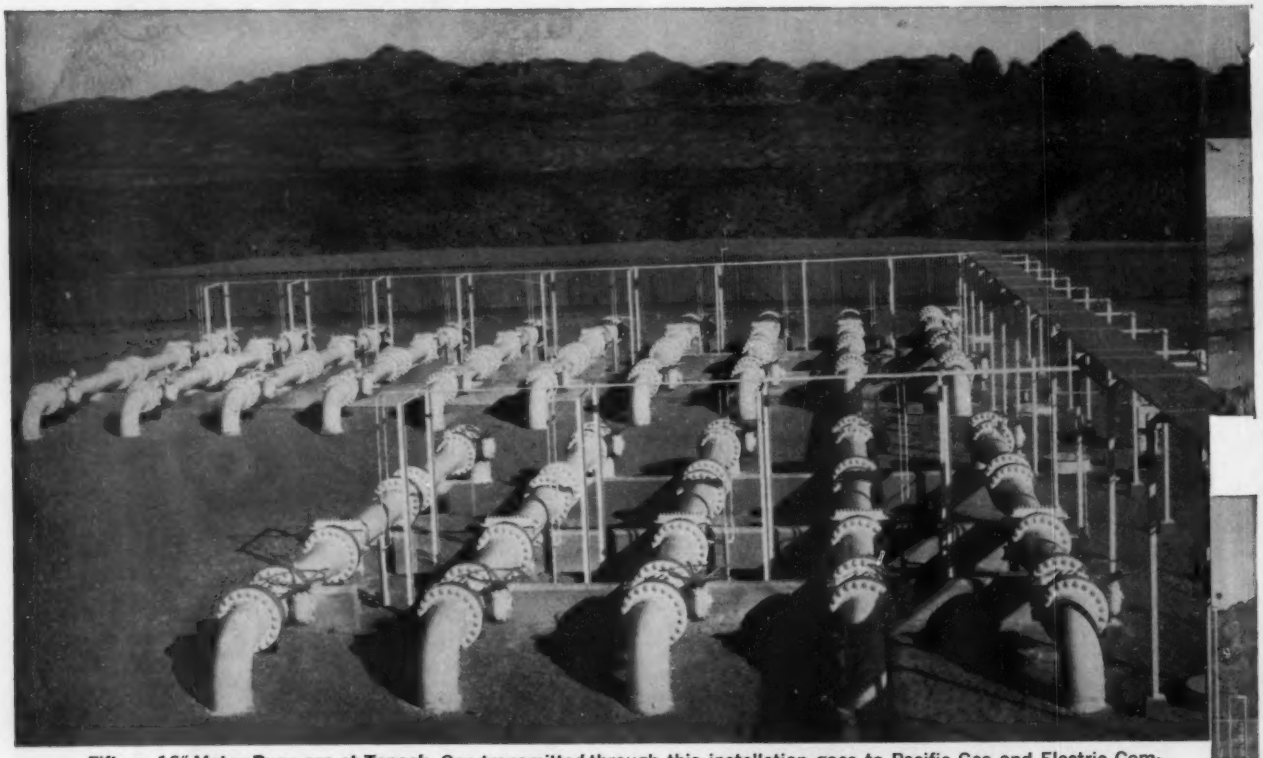
MODERN CAST IRON PIPE IS EVEN MORE EFFICIENT

- Centrifugally cast, it's tougher, stronger, more uniform.
- Standardized mechanical joints are bottle-tight under all gas distribution pressures . . . for all types of gas.
- Uniform wall thicknesses.
- Joint design allows deflection during and after installation.
- Service lengths and variety of standard fittings cut time and labor in congested undergrounds.

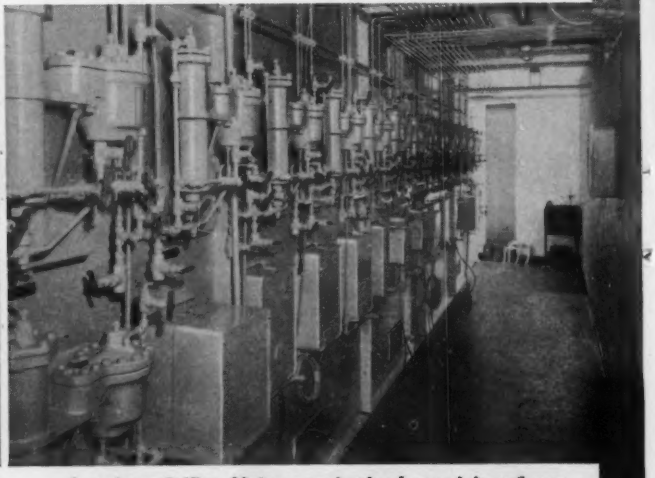
pipe FOR MODERN GAS DISTRIBUTION

Topock... where



Fifteen 16" Meter Runs are at Topock. Gas transmitted through this installation goes to Pacific Gas and Electric Company, Southern Counties Gas Company, Southern California Gas Company and Nevada Natural Gas Company.

Instantly Available to dispatchers at all times, are readings from the American Orifice Meters on the panel board. Charts are changed daily and mailed to a central point for integrating and billing.



American Orifice Meters on back of panel board are A-20's. 100 inch range mercury manometers are designed for operation up to 1800 psi working pressure.

American® meters measure nearly 1½ billion cu. ft. of gas per day

Topock Means Bridge in Indian language. These three 1,000 foot bridges carry two 30" and one 34" pipe line across the Colorado River for transmission to California. The natural gas in each aerial line weighs about six tons.

At Topock, Arizona, on the banks of the Colorado River, almost one and one-half billion cubic feet of natural gas a day, piped across the desert from New Mexico, Colorado and Texas, are mixed to supply the uniform BTU natural gas for the growing needs of California and Nevada. Metering and control is effected at this ultra-modern air-conditioned desert station. Because of the immense volume of gas measured at this point, minute errors could result in losses amounting to hundreds of dollars a day.

Here, fifteen American Orifice Meters, each capable of measuring and recording 100 million cubic feet of gas a day at 500 psi, provide the sustained accuracy required, for measuring the largest volume of gas flowing through any metering station today.

American Meter engineering assistance, and American precision equipment are available for every measurement and control problem. *Call* or *write* your nearest American Meter Company representative.

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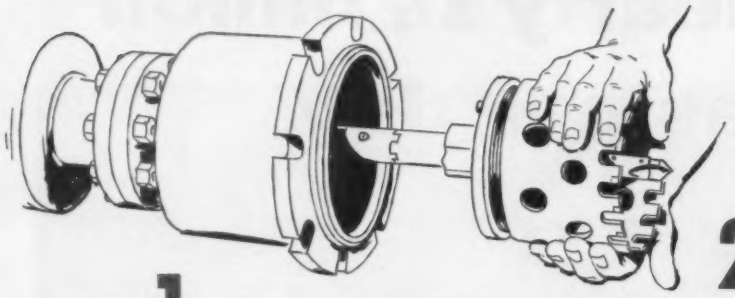
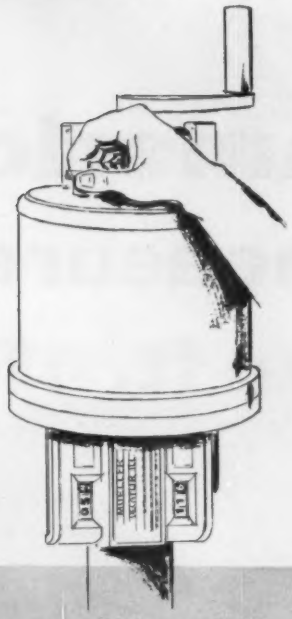
here's how to make a 6" cut with the "CH-6"...



1

attach cutter

Bolt adapter to drilling machine and advance boring bar with rapid feed hand crank. Lock boring bar with front lifting yoke. Remove retaining screw and insert shaft of cutter arbor into socket of boring bar. Replace screw in shaft and tighten with screwdriver. Screw pilot drill into cutter arbor and tighten. Screw shell cutter onto arbor and tighten. Retract boring bar and bolt machine to gate valve.



2

set feed travel indicator

Advance boring bar with rapid feed hand crank until pilot drill almost contacts main. (Full-time tool position indicator eliminates tool position guesswork.) Test entire set-up for pressure tightness. Set the amount of cut required by turning the "auto feed set" knob until the exact amount appears on the "feed travel indicator". (Large, easy-to-read numerals show the amount of cut in inches and tenths of an inch.) Engage automatic feed and feed travel indicator.

Save time on cuts up to 6"

use the new Mueller® CH-6 drilling machine

Now—Mueller Co. has developed a fast, automatic drilling machine for making cuts from 2" through 6" under pressures up to 1440 p.s.i.

The new "CH-6" Machine may be hand operated with a ratchet handle or power operated with the Mueller H-601 Air Motor or H-602 Gasoline Engine Drive Unit. *No changes in the machine are needed to use either method of operation.*

(In tests, under ideal conditions, the cutting speed of a power-operated CH-6 was found to be twice as fast as older machines.)

New features also reduce set-up time. Automatic power cutting completely frees the operator of continual check on the machine during cutting operation. Total on-the-job time is drastically cut!

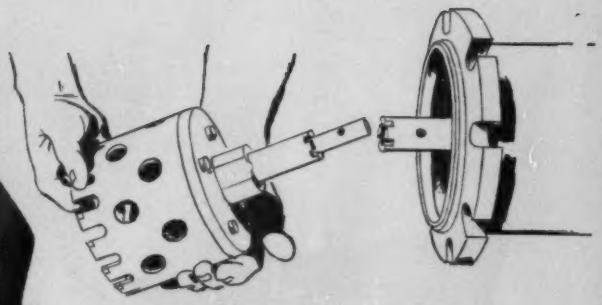
See your Mueller Representative or write direct for the full "time-saving" story of the new "CH-6" Machine.

NO-BLO®

3

make cut

Loosen pivot thumb screw and remove pivot pin. Remove front lifting yoke. Position air motor holder and replace pivot pin. Tighten thumb screw. Swing latch bolt into position and tighten wing-nut to secure holder. Slip H-601 Air Motor into holder. Open throttle slightly to align and engage spindles. Screw air motor retaining bolts into place and tighten. Open air motor throttle and set at proper operating speed. The "CH-6" will now make the cut automatically without supervision. When the cut is completed, the feed is automatically disengaged to prevent damage and loss of time. Overtravel of the boring bar is positively prevented.



4

remove machine and cutter

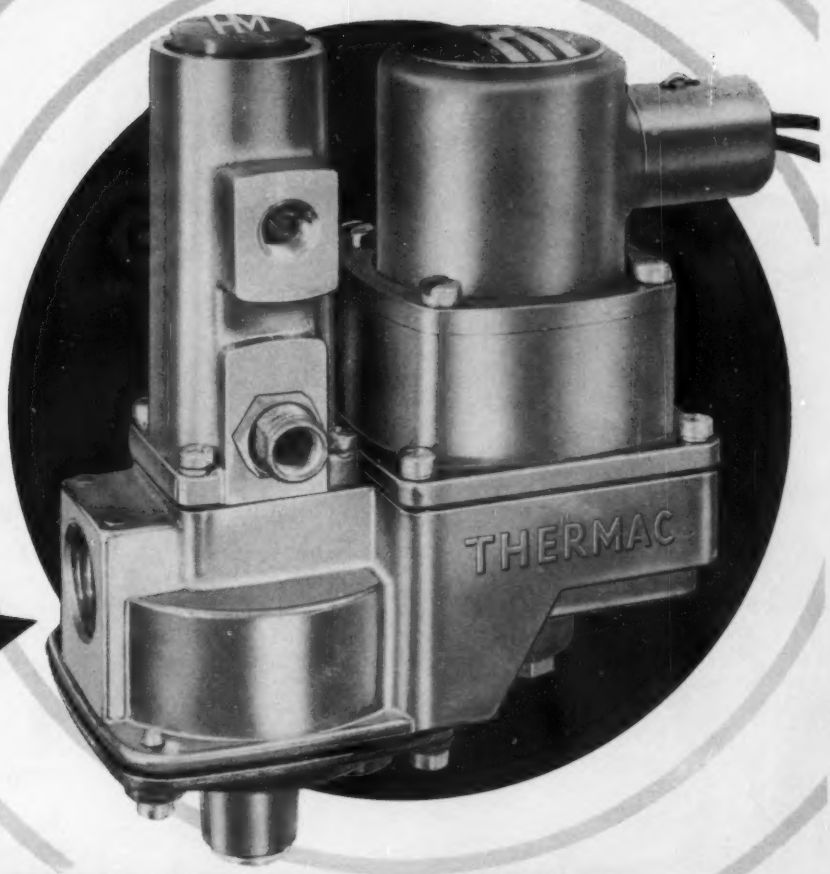
Check completion of cut by advancing cutter with hand feed crank. If cutter does not advance readily, further cutting is needed. If cut is completed, retract cutter with rapid feed hand crank and close valve. Remove air motor and holder and replace front lifting yoke. Remove machine. Advance boring bar and lock with front lifting yoke. Unscrew arbor retaining screw and remove cut-out section of pipe, shell cutter, cutter arbor and pilot drill as a unit.

MUELLER CO. since 1857 SERVING the Water and Gas Industries QUALITY

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles.
In Canada: Mueller, Limited, Sarnia, Ontario

For the Mass Market in the Heating Field!



THERMAC Model SLS-121
Unit illustrated has
100% pilot shut off.

COMBINATION CONTROL

REGULATOR • SAFETY • AUTOMATIC MAIN GAS CONTROL VALVE

Safe Lighting With or Without 100% Shut off.

Certified by A.G.A.

In a carefully calculated design based on 25 years gas control experience, THERMAC combines in this three-in-one control every feature important to the appliance builder, the dealer, and the customer. Identical in performance and capacity to the now universally accepted SLS-100, it is ideal where space below the control is limited. The unit consists of a regulator, quiet automatic main gas valve and a 100% pilot shut off when required. A manual reset is available in conjunction with automatic main gas valve. Every component is long proven and well accepted in the gas appliance field.

Drawings, prices and samples of the SLS-120 series are now ready for manufacturers interested in reducing the over-all cost of gas control assemblies.

Write, wire or telephone for immediate action.

THERMAC

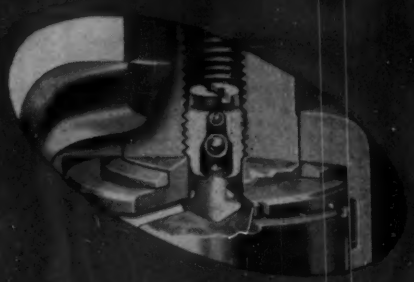
HM COMPANY

14296 East Sixth Street,
Corona, California. REdwood 7-3511

Distributed in Canada by Ontor, Limited.

In the spots that count... Homestead Valves are

LEAKPROOF



Reinforced Teflon and lubricant seal

Controlled pressurized lubricant seal

Lower cost per year valve service is guaranteed by Homestead Lubricated Plug Valves. These are the features that make them leakproof and extend their useful life . . . reinforced Teflon* head seal, double ball and lubricant sealed check valve, and their exclusive controlled pressurized lubricant seal.

Homestead's controlled lubricating system forces a chemical film over all sealing surfaces at more than 300 pounds pressure. In addition, it prevents sticking, by its piston-like movement of the plug during each lubrication. See how Homestead fills your valve needs. Write today for Reference Book 39, (Section 5), for complete information on Homestead Lubricated Plug Valves.

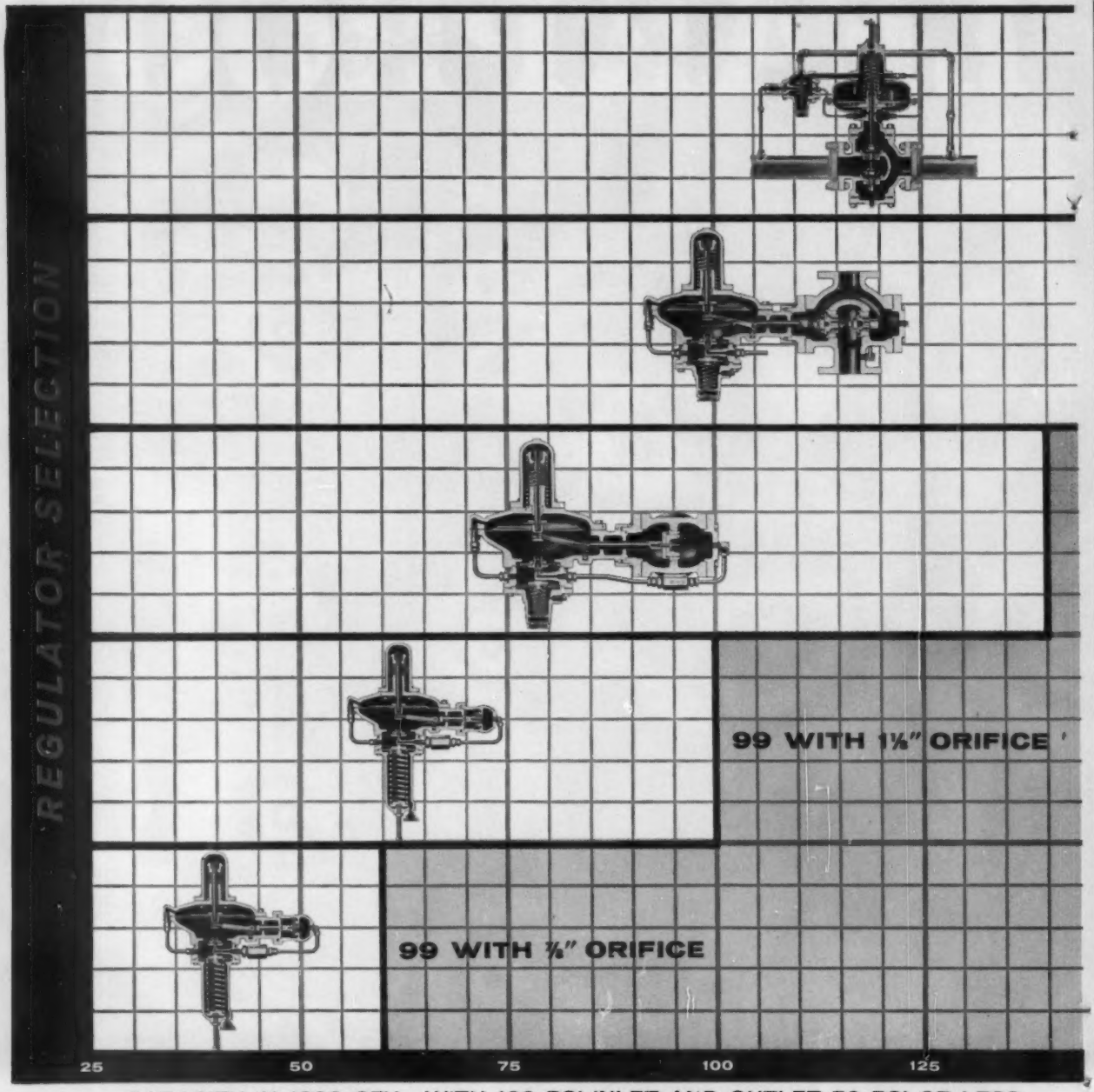
**DuPont registered trademark.*

h
v

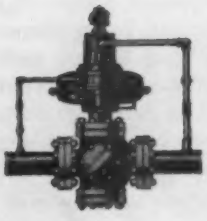
HOMESTEAD VALVE MANUFACTURING COMPANY

P. O. Box 405 • Coraopolis, Pa.

Complete range of Regulators

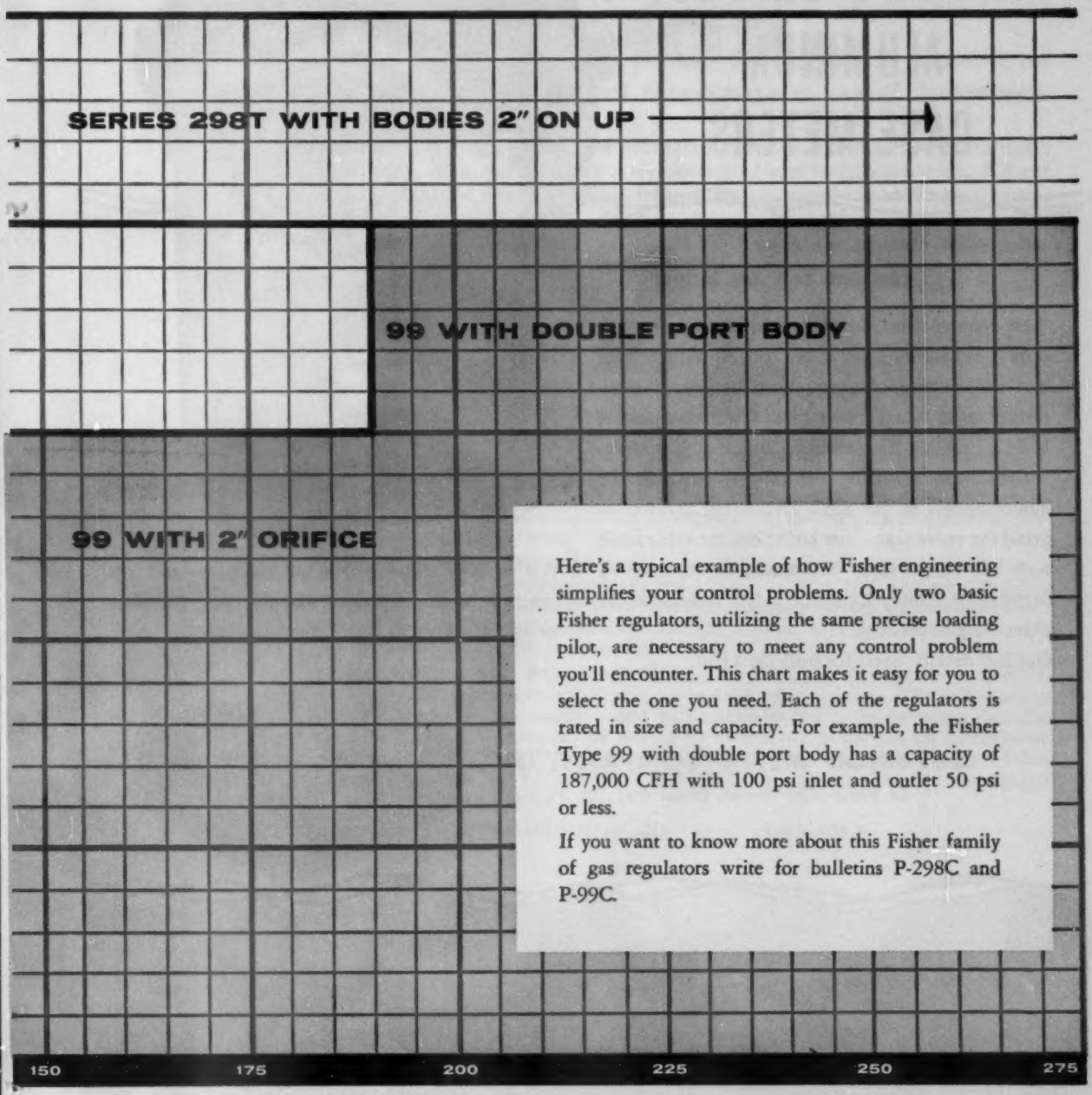


CAPACITY IN 1000 CFH—WITH 100 PSI INLET AND OUTLET 50 PSI OR LESS



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY...

for your Distribution System



Here's a typical example of how Fisher engineering simplifies your control problems. Only two basic Fisher regulators, utilizing the same precise loading pilot, are necessary to meet any control problem you'll encounter. This chart makes it easy for you to select the one you need. Each of the regulators is rated in size and capacity. For example, the Fisher Type 99 with double port body has a capacity of 187,000 CFH with 100 psi inlet and outlet 50 psi or less.

If you want to know more about this Fisher family of gas regulators write for bulletins P-298C and P-99C.

FISHER® Controls

SINCE 1880

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

Get full details. Send for bulletin 1150.

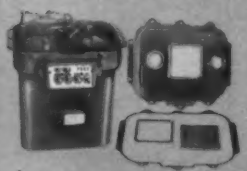
This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

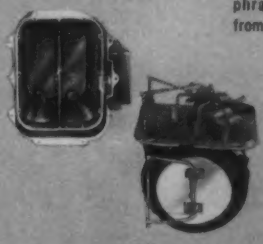
neptune

Look at these advanced design features:

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.

DATA SHEET NO. 3

Why to specify the Field

Triple-Fuel M+MG2 Draft Control for industrial gas-fired furnaces and boilers

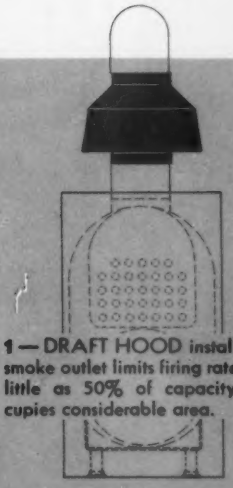
For efficient gas-fired operation, an all-fuel industrial furnace or boiler needs the draft assistance of a chimney, with the draft precisely controlled and fully adjustable. A draft hood cannot provide this, but the Field M+MG2 can. Here is a preformance comparison:

FIRING RATES: A draft hood, installed at the smoke outlet, reduces draft in the breeching to essentially zero. To avoid incomplete combustion, the furnace or boiler must therefore be gas fired at a rate substantially below capacity — frequently 50% less. As a result, the equipment must be oversized in order to meet load requirements. In contrast, the Field M+MG2 permits draft settings as low as .002″ and as high as from .2″ to .5″, depending on size, permitting a full range of firing rates.

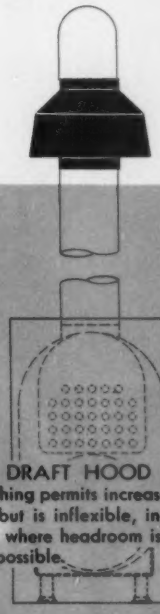
DRAFT LOSSES: A draft hood can be installed in the breeching, at sufficient height to develop a high draft, and permit a high firing rate. However, the hood cannot control draft. As a result, any position that provides enough draft for intermittent firing will produce an excessive draft during prolonged high-fire periods. The result is to dilute gases, and thereby waste fuel. In contrast, the Field M+MG2 can be adjusted to hold drafts at a precise setting under all conditions.

SPACE REQUIREMENTS: Even a comparatively small smoke outlet — a 12″ diameter — requires a draft hood 25¼″ x 24″ x 20″, and an inflexible requirement as to location. This bulk can present a serious problem. The 12″ Field M+MG2, in contrast, occupies only a 13¼″ x 15⅛″ area and permits a wide range of approved locations.

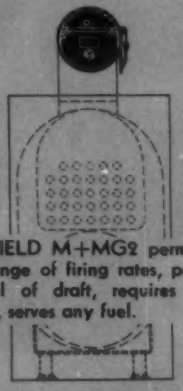
CHANGING LOAD REQUIREMENTS: Draft hoods permit no real flexibility in firing rates to meet changes in load requirements. The installation of a diverter at the smoke outlet automatically limits firing rates, and the diverter installation must be moved or restricted to permit an increase or decrease in efficient firing rates. In contrast, the Field M+MG2, provides for settings as low as .002″ and as high as .5″, permitting the maximum range in firing rates.



1 — DRAFT HOOD installed at smoke outlet limits firing rate to as little as 50% of capacity, occupies considerable area.



2 — DRAFT HOOD high in breeching permits increased firing rate, but is inflexible, inefficient, and, where headroom is limited, is impossible.



3 — FIELD M+MG2 permits a full range of firing rates, precise control of draft, requires little space, serves any fuel.

The fourth alternative, a direct connection into the stack, with or without a manual damper, is in direct violation of most city and gas utility codes, because of obvious hazards. It is also extremely inefficient.

Remove and file for reference.

Perforated for easy tear-out.

GAS-OIL FIRING: Wherever a gas installation must be altered, to handle oil as an alternating or stand-by fuel, a draft hood is immediately obsoleted, and so, in fact, is a single-fuel barometric draft control. Only the M + MG2 Field Triple Fuel Control is approved for all fuels.

SWITCHES: A draft hood provides relief for down draft pressures, but gives no visual sign of spillage. The double-acting M + MG2 gate opens outward to relieve such pressures, and by its position signals any spillage. In addition, the M + MG2 can be equipped with an automatic switch where the engineer finds conditions which could create frequent and prolonged down drafts. A time delay switch is usually recommended for an atmospheric burner; a thermal switch for a power burner. These switches provide an obvious means to measure the extent of a down draft problem so that an engineer can judge if and when some remedial action is indicated.

SPILLAGE: A cause of recurrent spillage, where a draft hood is used, is loss of prime resulting, during off-fire periods, from the abrupt cooling of the stack by an unrestricted volume of boiler room air. Then, when the burner comes on, there is a spillage of gases until the chimney is again fully primed. This condition is aggravated by a low stack, or a prolonged off-fire period. The Field M + MG2, in contrast, does not introduce any boiler room air into the stack until or unless draft is in excess of requirements, and therefore the chimney does not lose its prime between normal industrial firing periods.

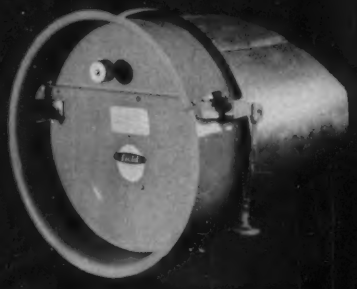
APPROVAL REQUIREMENTS: The M + MG2 is Listed by Underwriters' Laboratories as a single-acting control for solid fuels and oil, and as a double-acting control for gas. It has the approval of America's leading gas utilities, and of America's leading cities where codes apply.

A CONTROL OF UNMATCHED QUALITY: Recognizing that gas is a critical fuel, the M + MG2 is built to maximum standards, and is virtually impervious to wear. The ring is die-formed, for maximum strength. The gate is the heaviest made — 39 pounds for a 32 inch control — and is mounted on a stainless steel knife edge. The bearings are self-cleaning — soot cannot accumulate, and are self-aligning to distribute wear over a wide area. Thus mounted, the gate is essentially friction-free, providing extreme sensitivity both to internal and external pressures. The Field M + MG2 can be installed with complete and absolute confidence.

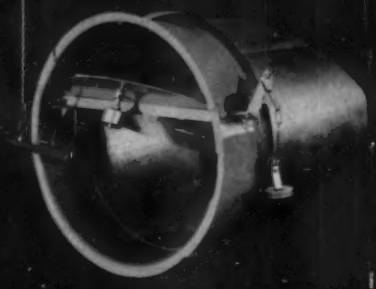
Data Sheet No. 4 will cover Field Draft Controls for Incinerator Applications.

THE FIELD TRIPLE-FUEL M + MG2 DRAFT CONTROL

M + MG2 Double Acting for Gas, opens inward to regulate up drafts, and opens outward to relieve internal pressures.



M + MG2 Single Acting for Oil



M + MG2 Barochek for Solid Fuels

FIELD CONTROL DIVISION

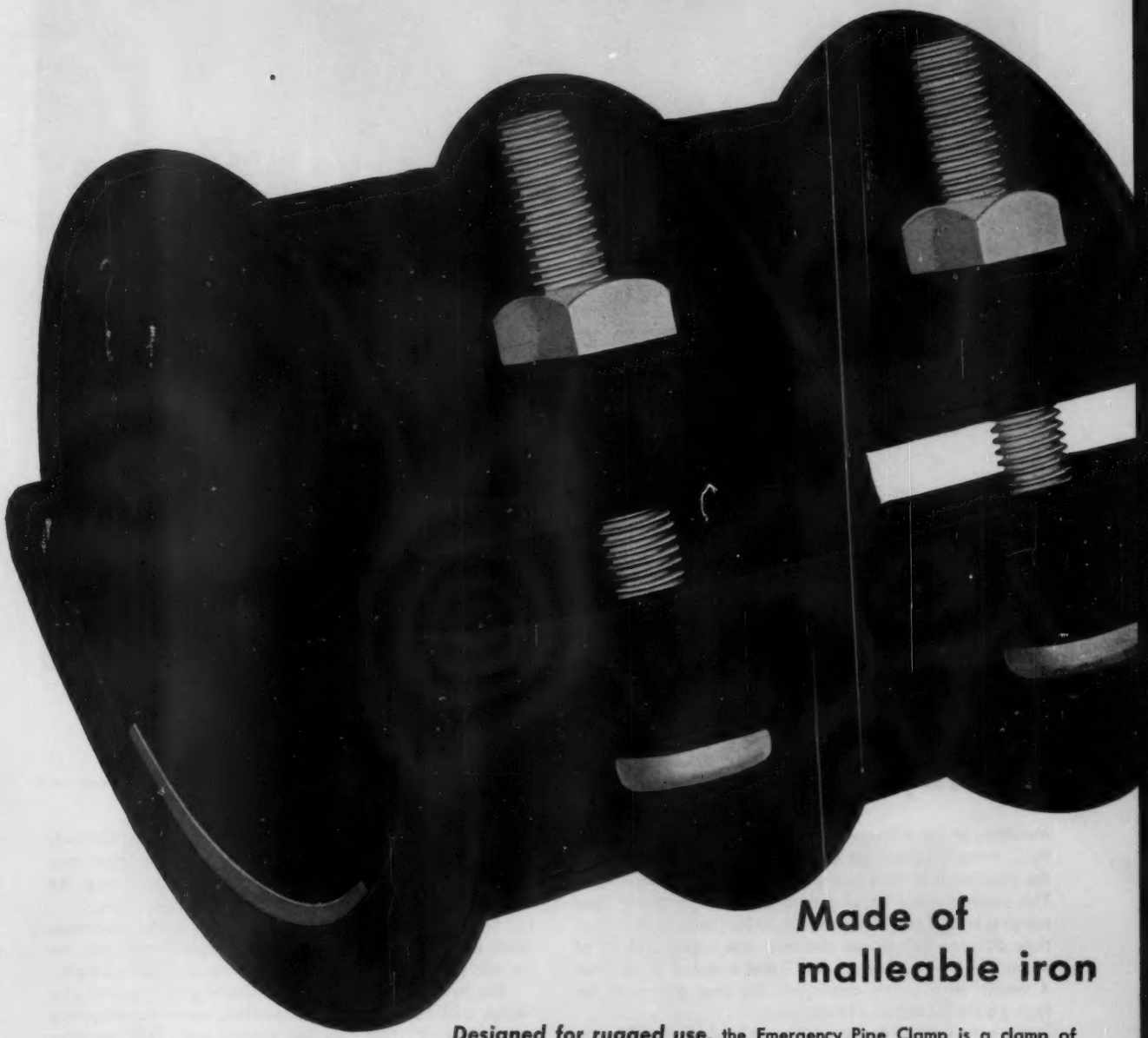
H. D. Conkey & Company, Mendota, Illinois

AFFILIATES:
Conco Building Products, Inc. • Brick, Tile, Stone — Conco Materials Handling Div. • Cranes, Hoists

Represented in Canada by Ontor Limited, 12 Leswyn Road Toronto 19, Ont., Canada

field

PIPE REPAIR PERMANENCE



Made of malleable iron

Designed for rugged use, the Emergency Pipe Clamp is a clamp of almost unlimited strength. You might say it looks fairly simple. Yet fifty years of experience have gone into its design . . . the heavy ribbing to "take" the bolt-pull, the skillful shaping of the bolt lugs for terrific strength and a free wrench swing. The full length, massive hinge which no strain can loosen! The over-thickness of metal throughout to make child's play of any pressure! The glove-like fit . . . result of shaping each clamp over an accurate mandrel, pulling it down with a 12,000 pound air vice and sledging to complete snugness.

When you put on the Emergency Pipe Clamp, it is there to stay. Tens of thousands of them are still in place after 20, 30, 40 years' service. Made in C.I. and steel pipe sizes—½″ to 12″ inclusive.

Write for Catalog GW
M. B. SKINNER CO., South Bend 21, Ind.

SKINNER-SEAL EMERGENCY PIPE CLAMP

Naugatuck KRALASTIC

KRALASTIC PIPE
cut laying time 75%

Members of the Biltmore Forest Country Club in Asheville, N.C., were able to "get out" and "play through" during the installation of their new underground sprinkling system. This system, made up of over 6 miles of Kralastic® pipe ranging in size from 6" main lines to 1¼" laterals, will soak their 50-acre golf course with over one million gallons of water in a 24-hour period. And it was installed in less than 4 weeks' time... only one-fourth the time estimated for laying a similar system of metal pipe.

An extrusion of a resin-rubber blend, Kralastic pipe weighs only about one-seventh as much as iron pipe... eliminates the expense of special trenching, bedding and handling equipment. Hard, tough, but easily worked, Kralastic pipe can be quickly cut with a hack saw then permanently joined with a solvent weld, eliminating the expense of special cutting and threading operations.

Kralastic pipe also offers superior physical properties that make it a wise, long-term investment. It won't rust, rot or corrode, and is impervious to water and soil elements.

No wonder the demand for Kralastic pipe is growing by leaps and bounds... for transmitting water for irrigating and drinking... for carrying natural gas... for handling corrosive chemicals, crude oil and salt water... and as electrical conduit!

US RUBBER

United States Rubber

Naugatuck Chemical Division 626K Elm Street Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

DIST. OFFICES: Akron • Boston • Gastonia • Chicago • Los Angeles • Memphis • New York • Phila. • **CANADA:** Naugatuck Chemicals, Elmira, Ont. • **CABLE:** Rubexport, N.Y.

PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

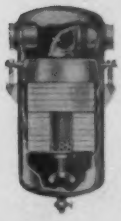
Dollinger makes ALL TYPES of filters as shown on this page, plus special filters for unusual filtration problems. New users of one specific type of Staynew filters often find a second Dollinger filter performs a great, added service in other processes or operations. Dollinger maintains complete engineering, design and laboratory facilities for the development of special filters for new and unusual applications.

Write for complete information on any of the Staynew filters illustrated. Be sure to specify Bulletin Number or Numbers. Consult Dollinger Engineers on any special filtration problems—no obligation. Dollinger Corporation, 68 Centre Park, Rochester 3, N.Y.

PIPE LINE FILTERS

Model CPH
Pipe Line Filter
Bulletin 200

Model CVH (Vacuum)
Pipe Line Filter
Bulletin 200



Model AAPHS
(Absorption)
Pipe Line Filter
Bulletin 200

Model HPH and AHPH
(High Pressure)
Pipe Line Filter
Bulletin 200

LIQUID FILTERS

Model HE (Sump)
Liquid Filter
Bulletin 330

Model ELS (Pressure)
Liquid Filter
Bulletin 300

AIR INTAKE FILTERS

Model IDR
(Ground Level)
Air Intake Filter
Bulletin 100

Model DS (Silencer)
Air Intake Filter
Bulletin 100

Model D (Outdoor)
Air Intake Filter
Bulletin 100

Model C (Indoor)
Air Intake Filter
Bulletin 100

VENTILATION FILTERS

Electro-Staynew
Mist Collector
Bulletin 420

Electro-Staynew
Precipitator
Bulletin 400

Automatic
Ventilation Filter
Bulletin 500

Dry and
Viscous Panel
Ventilation Filters
Bulletin 600 and 700

Designed for utilities, the Barber-Greene Runabout digs only the size trench required—no excess material to backfill. Also pulverizes material, simplifying backfilling. Write for complete information.

Helping to halt the rising cost of gas distribution

Distribution costs of gas utilities continue to rise. This is partly due to their specialized requirements and the need for specialized tools. For service ditching, there is a special machine designed specifically for the peculiar needs of utilities—the Barber-Greene Model 705-B Runabout.

Runabout advantages

- It travels to the job under its own power. No trailer required.
- Digs straight down, jumping walks and other obstructions . . . leaves no ramps to be dug out by hand.
- Exclusive Hydra-Crowd transmission gives an infinite selection of digging speeds to 16 feet per minute. No stopping to shift speeds. Assures maximum speed in any soil.
- New curved digging teeth give three times longer life.
- Rugged construction allows it to dig where other machines fail, and cuts maintenance costs to minimum.
- Easily operated from cab or ground. Finger-tip controls.

The Runabout is just one of Barber-Greene's line of wheel, ladder, and vertical boom ditchers.

No trailer needed with the Barber-Greene Runabout Ditcher. It speeds from job to job under its own power. Ready to dig on arrival.

58-22-D

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

Roots-Connersville Reduces Gas Metering Costs 6 Ways...

Differential gauge is supplied as standard equipment on all meters.

Each meter is equipped with an integrator which records volume of gas directly in cu. ft. at line temperature and pressure.

Casing is fabricated from fine-grain cast iron, well-ribbed to prevent distortion due to operating pressure up to 125 lbs. or more.

Timing gears at each end of the meter prevent vibration and backlash.

Bearings are oversize, self-aligning and are readily accessible.

Gears operate within and are lubricated by an oil bath.

Impellers are made of fine-grain cast iron and are precision machined to fine clearances, holding "slippage" to an irreducible minimum.

1 *With Low Initial Investment.* One Roots-Connersville meter does the work of two or more meters of other types. Additional savings are made in piping, foundation and installation costs.

Comparative Analysis	SPACE OCCUPIED	TOTAL CAPACITY	METER COST	INSTALLING COST	TOTAL COST
FOUR DIAPHRAGM METERS					
ONE R-C METER					

Why buy two when one will do?

2 *With Permanent Accuracy.* Measuring chambers and impellers are precision machined to assure built-in accuracy. Free-rolling impellers have sharp edges making the meter self-cleaning.

3 *With Lower Maintenance Costs.* Roots-Connersville meters have no valves, valve gear or other small parts to wear out and cause metering inaccuracies. Maintenance is confined to lubrication of gears and bearings and an occasional field check of the operating differential.

4 *With Minimum Pressure Drop.* Straight-through design eliminates winding passages and restricting ports. Even at extremely low flows, Roots-Connersville gas meters retain "cash register" accuracy.

5 *By Maintaining Proof.* Accuracy is not affected by variations in specific gravity or rate of flow, pulsations, type of gas handled, pressure drop, entrained impurities, water level or other factors.

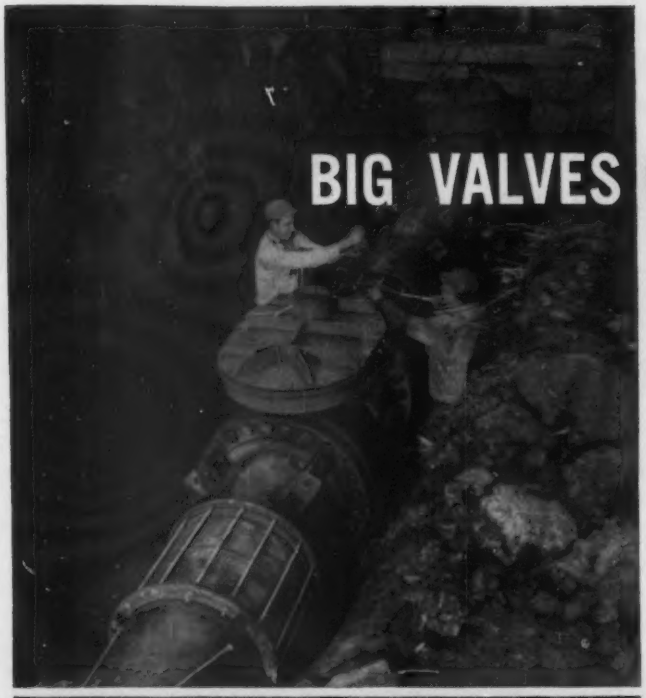
6 *By Providing Large Rated Capacities.* Capacities range from 2000 to 1,000,000 cfh with an operating range of 15:1, eliminating the need for multiple meters and assuring low cost/cubic foot/hour metering.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

658 Oregon Avenue, Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto, Ont.

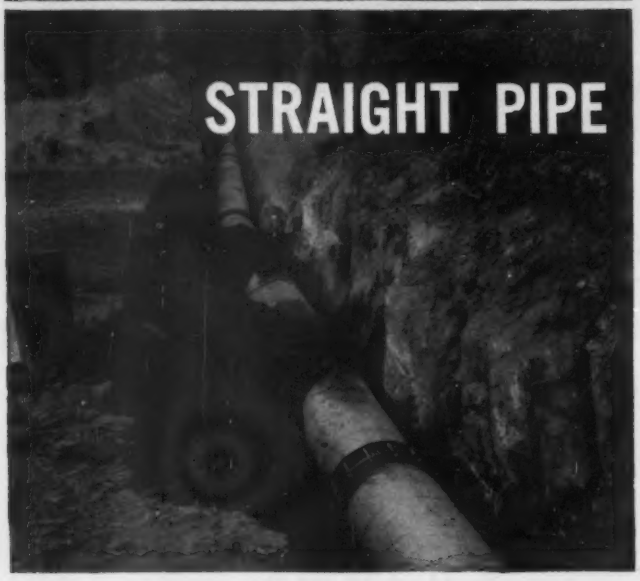
For additional data, please refer to our section in **Mechanical Catalog** or **Chemical Engineering Catalog** or write for your copy of descriptive Bulletin M-152.



BIG VALVES GO IN FAST

... *the Dresser way*

These men are setting big valves and fittings the *easy* way ... the Dresser way. The assemblies were bolted and readied in the shop (or above the ditch), then connected up with gastight Dresser Couplings. No need for exact pipe fitting. No time-consuming back-breaking problems of misalignment. There's adequate "play" in the couplings to compensate for inexact pipe lengths and alignment.



STRAIGHT PIPE TAKES CURVES

... *the Dresser way*

Pipe goes in faster on the long stretches too, with time-proved Dresser Couplings. Slight changes of direction are accommodated in the couplings without costly bends and specials. With each of the Style 38 Dresser Couplings shown in this photo, you can take up to 6-degrees of deflection.

Test after test proves that Dresser Couplings are engineered to meet every requirement of the modern distribution system ... with unbeatable ease of installation, over-all economy and gastight safety at today's higher pressures.

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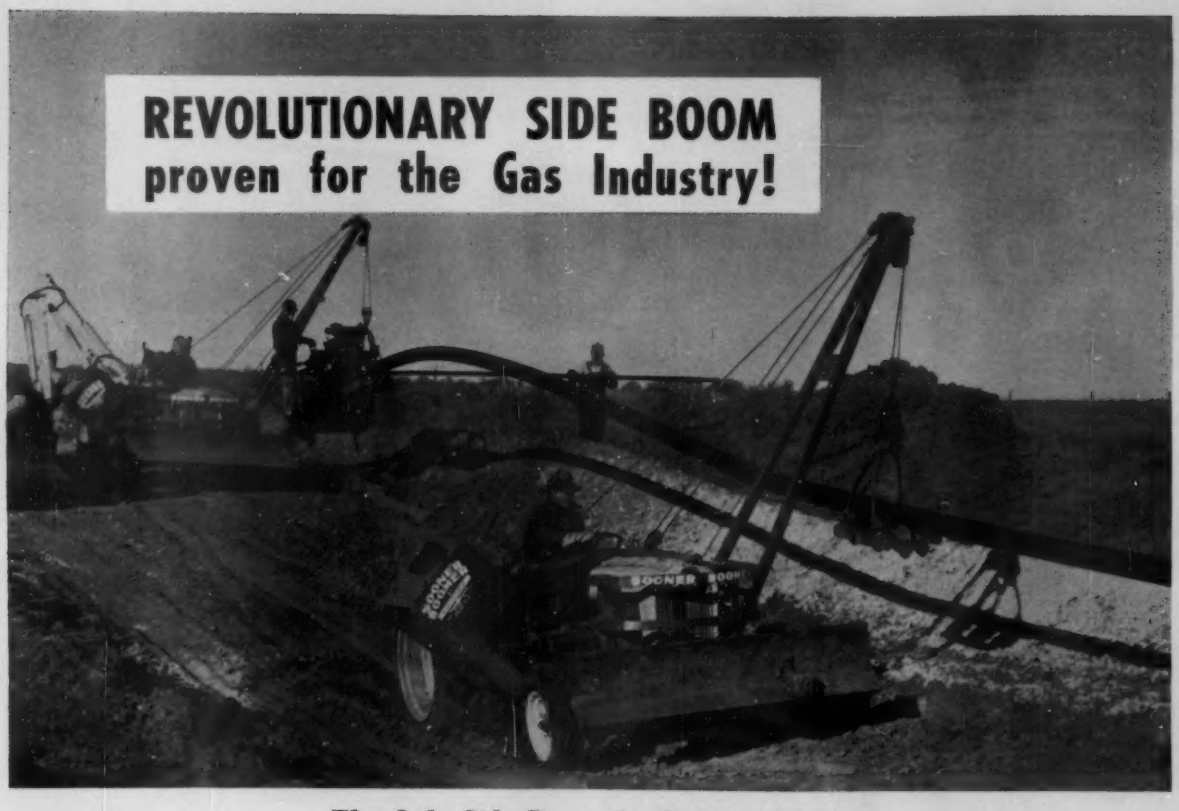

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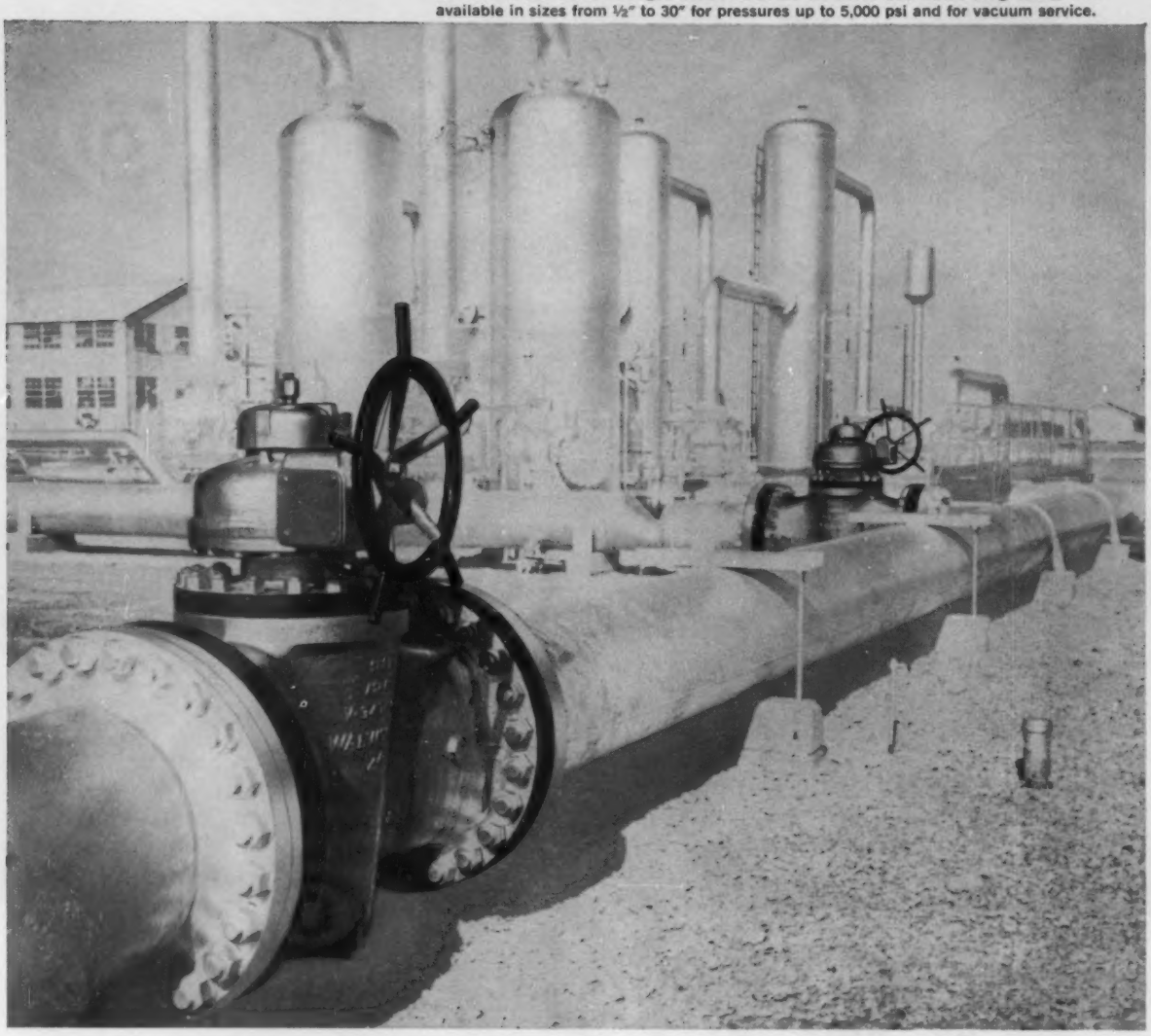

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GAS

JUNE 1958

Gas network analysis program for high-speed computer

By FRANCIS L. DUFFY
Cincinnati (Ohio) Gas & Electric Co.

This program provides a simple, rapid, and flexible method of high capacity for analyzing gas networks. It is especially valuable in investigating possible improvements, and makes possible the analysis of networks for which manual solutions are impractical.

GAS exclusive

UNTIL recent years, the solution of gas network problems has always been a tedious and time-consuming chore. However, with the development of the analog computer and more recently of the digital computer, the analysis of gas networks has been greatly simplified.

The Cincinnati Gas & Electric Co. has developed a program for the IBM 650 computer which will quickly solve gas network problems. The program employs an iterative procedure based on a modified Hardy Cross method.

In developing the program, special emphasis was placed on simplicity, capacity, and flexibility. Artificial devices, such as assigning a fixed direction to a main, were avoided as much as possible. Notations, terms, quantities, etc., agree with those used by the gas engineer. Very little additional preparation, over and above that required for hand calculation, is necessary, and no special skills or knowledge are required.

Although the program was developed for the solution of low pressure networks, it may be used for intermediate or high pressure problems as well. Networks with 1800 main sections may be analyzed (with the 2000-word capacity drum). Any flow formula that can be reduced to the form.

$$h \text{ (or } P_a \text{ or } P_1^2 - P_2^2) = ALQ^2$$

can be used. Main length and flow may be in any

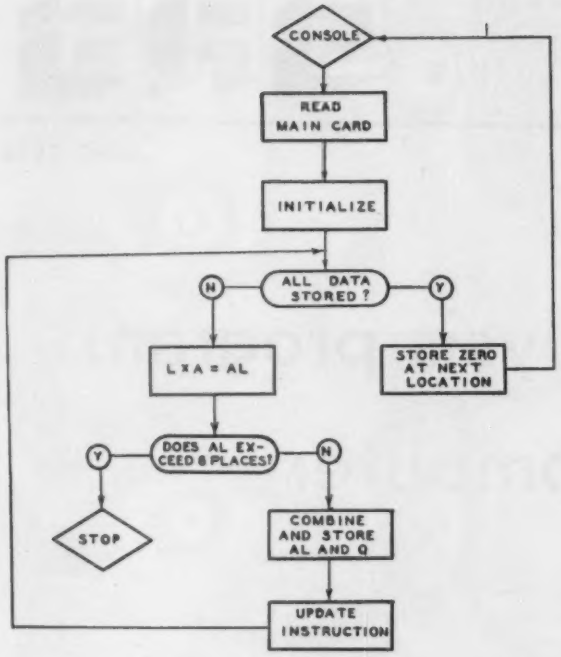


Fig. 1. Main data loading.

units whatsoever. The network may be balanced to a predetermined limit of accuracy, and progress of the problem may be checked at any time.

• Preparations

Preliminary preparations are essentially the same as would be required for analysis by any method. A map of the network is prepared, the location and magnitude of loads are determined, and these loads noted on the map. Each section of main is numbered consecutively, beginning at one. It is important that no number be missed or duplicated. A section of main is that main between two points, a point being defined as: a main junction, a point of application of a load, the location of a reducer between mains of different sizes, a point chosen arbitrarily to avoid excessive length, etc. The size and length of each section must be known. Each loop is also numbered, it being usual but not necessary to number consecutively from one. The only requirements for loop numbering are that all numbers be different and less than 2000.

A first assumption of the flow pattern must be made accounting for all flows and considering all sources of supply. A flow must be indicated for each main section, each flow consisting of a magnitude, represented numerically and a direction, represented by an arrow. A magnitude of zero is allowable, but a direction must still be assigned. A reasonable assumption of flow should be made, but it is not worthwhile to spend time in an attempt to make a good rather than a poor assumption since the large corrections made during the first few iterations quickly adjust flow to a better value.

Finally, data cards are punched with the necessary information. At this point, consideration might be given to the possibility of preparing a permanent listing of main numbers, sizes, and lengths, or even a set of master cards, for future use.

• Card format

There are two kinds of data cards—main cards and loop cards.

The main cards are load cards representing the original data as it appears on the map. The first word identifies by number the first main represented on the card; that is, the main represented by word two. Words two to eight contain the size, length, and original assumption of flow for seven consecutively numbered mains. Any units of length and flow may be used, as explained under "Results," but consistent units are required in any particular problem. A sample card may contain the following information:

Word	*Columns*	*Data*
1	1–10	0000361961
2	11–20	0605501360
3	21–30	0404250075
4	31–40	1215502750
5	41–50	0810000000
6	51–60	0821501965
7	61–70	0808750950
8	71–80	0000000000

The 36 in the first word indicates that main No. 36 is represented by word two. The instruction address, 1961, appears on all main cards. Assuming that in this particular problem length is in feet and flow in cfh, main No. 36 is a 6-in. main, 550 ft long, and the assumed flow is 1360 cfh. Main No. 39 is an 8-in. main, 1000 ft long and the flow was assumed to be zero. The zero in word eight marks this as the last card, the total number of mains in the problem being 41.

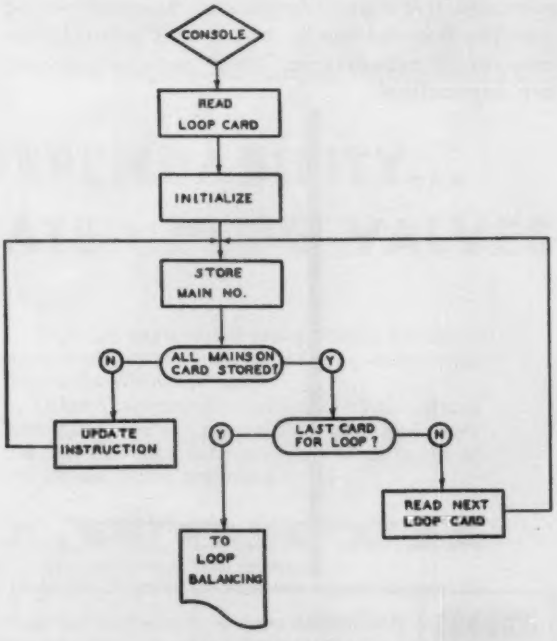


Fig. 2. Loop data loading.

All mains which are parts of loops must be represented on main cards. In addition, dead-end mains may be numbered and loaded with the main data if drum storage is available. Such mains will receive no corrections during the progress of the problem, but the pressure drops and flows will be punched out with the final results.

A modified main card is used to change the size or length of a main in storage. This is useful in running variations of a problem and avoids the necessity of changing the original main cards. A sample of this type of card appears as follows:

Word	*Columns*	*Data*
1	1–10	0000371891
2	11–20	0804150000

The remainder of the card may be blank. This card changes main number 37 to 415 ft of 8-in. main, the flow remaining unchanged in magnitude or sign. The card may be used immediately after the main data is loaded, or after a balance has been reached, the new variation proceeding from the previous balance.

Loop cards are non-load cards representing the mains in any particular loop together with the direction of flow in each main. Nine mains are represented on a card and two or more cards may be used for one loop if necessary. A sample loop card may be as follows:

Word	*Columns*	*Main Numbers*
1	1– 8	00251920
2	9–16	00080000+
3	17–24	00090000+
4	25–32	01270000−
5	33–40	01280000−
6	41–48	01290000−
7	49–56	00560000+
8	57–64	00190000−
9	65–72	0000000000
10	73–80	0000000000

The loop number is 25. The instruction address 1920 appears on the last card for each loop. If more than one card is required for a loop, all but the last card carry 1970 in this position. Loop number 25 consists of mains 8, 9, and 56, in which flow was assumed in a clockwise direction, and mains 127, 128, 129, and 19, in which flow was assumed in a counterclockwise direction. The conventional notation for direction is used here, but if opposite signs are used, even in just one loop, the results are not affected. This is particularly advantageous in handling regulators. Each regulator must be interconnected with at least one other by a loop or main path. Either direction may be designated as positive.

Every main which is part of a loop must be represented on one or more loop cards. A loop card should be punched for every simple loop in the network, and in addition, all sources of supply must be connected by main paths which act as loops and are represented by loop cards. It is allowable to prepare lop cards for larger loops, encompassing two or more simple loops, or for a second and different path between regulators. Such redundant loops may sometimes be used to advantage in order to speed convergence.

As an example of the effect of redundant loops on convergence the following cases may be cited. In a system having two regulators, two entirely different paths between these regulators were designated as loops. The system was balanced in 22 iterations using one of the loops. With the other loop 32 iterations were required. With both loops a balance was reached in 13 iterations. In another problem of the same type, comparable figures were 17, 36 and 12 iterations. In still another problem, introduction of two redundant loops reduced the iterations required from 30 to 10.

• Program load cards

To conserve space for main storage, the instructions for each phase of the problem are loaded separately, and as a result more card handling is necessary. Far from being a disadvantage, however, this feature affords the operator greater control and increases flexibility. There are five decks as follows:

1. Main deck
2. Loop deck
3. Punch-out deck
4. Main data punch-out deck
5. Main data reload deck

In addition, there are single cards as follows:

1. Supress check punch. (used with loop deck)
2. Reactive check punch (used with loop deck)
3. Limit of $\triangle Q$. (used with loop deck)
4. Shift card (used with punch-out deck)

• Main data loading

The factor A incorporates all constants in any particular problem and must be computed in advance to conform with the requirements of the problem. Locations 1900 to 1950 inclusive are reserved for A

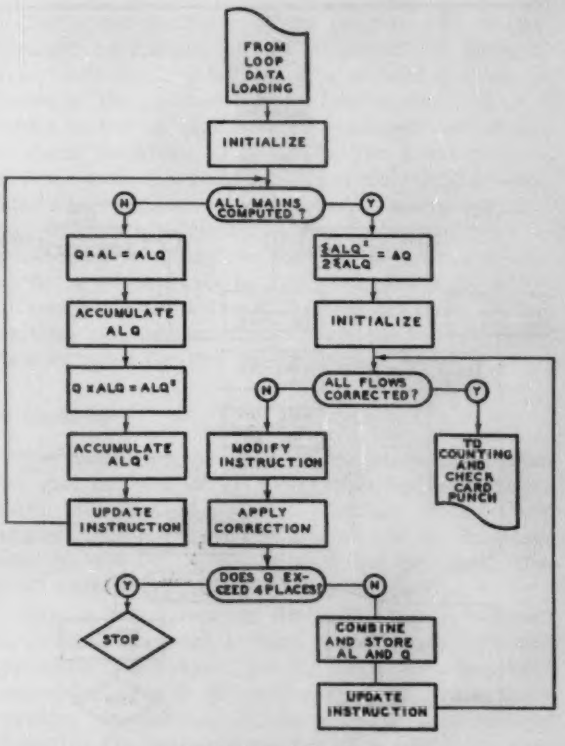


Fig. 3. Loop balancing.

factors, the last two digits of the address corresponding to the main size, the A factor for 6-in. main being stored in 1906, etc. Complete flexibility is attained by this method. Factors may be computed for any size pipe, specific gravity, base temperature, base pressure, flowing temperature, etc., and conversion factors may be introduced to convert units of length and flow if required. Odd sizes of main, for example 1½-in., may be assigned to an unused address, for example 1937, as long as the main data card is coded with this same number. Mains with the same nominal diameters, but different internal diameters, may also be treated in this manner. The factor for an 18-in. main, with an internal diameter of 17.250 in., might be stored in location 1918 while the factor for another 18-in. main in the same problem with an internal diameter of 17.500 in. might be stored in location 1919 and this main coded on the main data cards as if the nominal size were 19 in.

The appropriate A factors are loaded along with the main data loading instructions. Following these are the main data cards. As the main data cards are read, the proper A factor is determined by the diameter, multiplied by the length, and the new factor, AL, is recombined with the flow for storage. Each main is stored at the address corresponding to the main number. *Fig. 1* is a flow chart of the main data loading program.

• Loop calculations

The Hardy Cross method is essentially a method of determining a flow correction for each loop. This correction can be expressed as

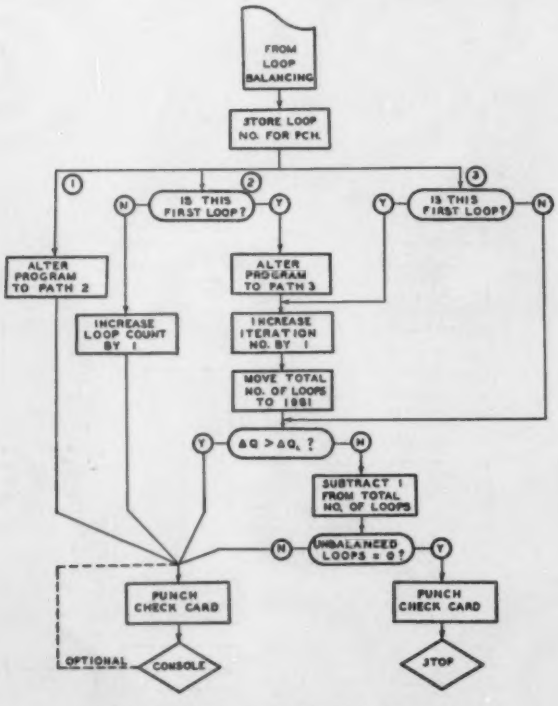

FROM LOOP BALANCING
STORE LOOP NO. FOR PCH.
IS THIS FIRST LOOP?
IS THIS FIRST LOOP?
ALTER PROGRAM TO PATH 2
ALTER PROGRAM TO PATH 3
INCREASE LOOP COUNT BY 1
INCREASE ITERATION NO. BY 1
MOVE TOTAL NO. OF LOOPS TO 1991
ΔQ > ΔQ₁ ?
SUBTRACT 1 FROM TOTAL NO. OF LOOPS
UNBALANCED LOOPS = 0 ?
PUNCH CHECK CARD
PUNCH CHECK CARD
OPTIONAL
CONSOLE
STOP

Fig. 4. Counting and check card punch.

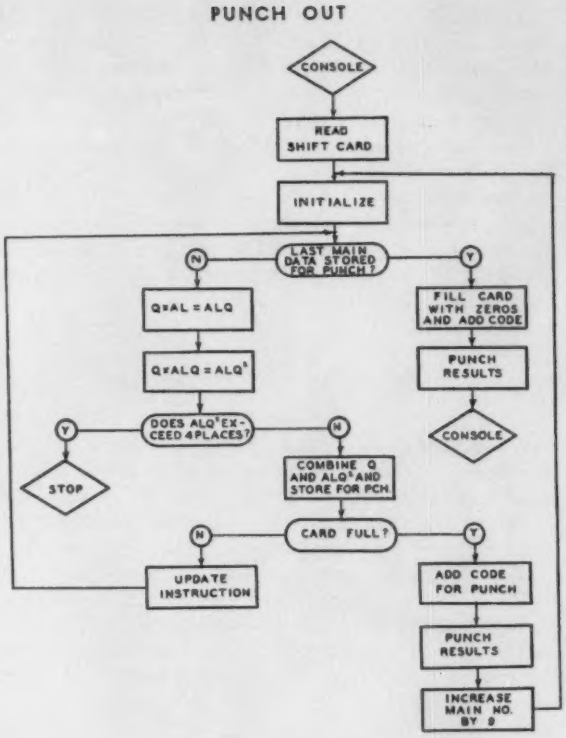


Fig. 5. Punch out.

$$\Delta Q = \frac{\Sigma ALQ^2}{2\Sigma ALQ}$$

The numerator is the algebraic summation of the pressure drops for a particular loop. The denominator is the summation of the resistance to change of flow which can be expressed in general as $nALQ^{(n-1)}$. Since A is always positive and L always has the same sign as Q, the numerator may be either positive or negative while the denominator is always positive. ΔQ, therefore, always has the same sign as Q.

The correction is made by subtracting ΔQ algebraically from the value of Q for each section of the loop to which it applies. Since some mains will be a part of more than one loop, it is obvious that such mains will receive more than one correction during each iteration. If a loop is perfectly balanced, the value of ΣALQ^2, by definition, will be zero, and the value of ΔQ will be zero.

In adapting the Hardy Cross method to the IBM 650, a modified form was used. Whereas, in the original method, a correction factor is computed for all loops before any corrections are applied, in the modified method a correction factor is computed for each loop and applied to the mains in that loop before proceeding to the next loop. This is accomplished by processing one loop at a time, each loop being represented by one or more loop cards. The loop instruction deck having been loaded, all loop cards are placed in the hopper and processed loop by loop. When one iteration has been completed, the loop cards are removed from the stacker and recycled until the required accuracy has been attained. Flow charts for

loop data loading and loop balancing are shown in *Figs. 2 and 3*.

This card recycling technique was adopted to simplify the program and conserve drum storage. In addition, however, it also simplifies the preparation of data and increases flexibility. For example, additional loops may be added to speed convergence, completely balanced sections of the network may be removed, or the problem may be ended at any time.

Fig. 4 is a flow chart of the accounting procedure which counts the loops in the problem, the number of balanced loops, and the iterations. As each loop is completed, a check card will be punched with the following information:

Word	*Columns*	*Information*
1	1–10	Loop number
2	11–20	ΣALQ
3	21–30	ΣALQ^2
4	31–40	Number of loops in problem
5	41–50	Number of unbalanced loops
6	51–60	Iteration number
7	61–70	ΔQ_L (Predetermined limit of accuracy)
8	71–80	ΔQ (Value of flow correction for this loop)

The check cards may be examined as the problem progresses. The value of ΔQ and the number of unbalanced loops will indicate the progress of the problem and the problem stopped whenever the operator considers the balance satisfactory. Check card punching may be omitted or restarted by means of the two cards provided for this purpose.

The predetermined limit of accuracy, ΔQ_L, is loaded with the loop deck. When, in any one iteration, the value of ΔQ is equal to or less than ΔQ_L for all loops, the computer will come to a programmed stop.

• Results

The fact that any units may be chosen for lengths and flows has been mentioned previously. Conceivably, any units of length, such as feet, meters, rods, miles, etc., and any units of flow, such as cubic feet per hour, liters per minute, or tank car of liquefied gas per day, could be used by incorporating the appropriate conversion factor in the A factor. In addition to this, the units may be varied by a power of 10 without altering the A factor. Compensation is made for this alteration by selecting the proper shift card which is the last card of the punchout deck. Use of the proper shift card results in the value of ALQ^2 being rounded to the proper number of decimal places. The flow and pressure drop will be punched for each main in the network including any dead end mains which have been numbered and loaded. Results for nine mains are punched on one card similar to the following:

Word	*Columns*	*Results*
1	1– 8	00000019
2	9–16	00570175+
3	17–24	01350590+
4	25–32	00651593+
5	33–40	00060062–
6	41–48	01030929+
7	49–56	00010053+
8	57–64	00000020+
9	65–72	00360481+
10	73–80	00832247+

The 19 in the first word indicates that this card contains results for mains 19 to 27. In words 2-10 the first 4 digits are values of ALQ^2 while the last 4 digits are the final flow values, expressed in the units originally selected. If for example this is a low pressure problem and Q is in cfh, the final results for main number 20 are a flow of 590 cfh and a pressure drop of 1.35-in. wc. If this is an intermediate pressure problem with flow in Ccfh, then results for main number 20 are a flow of 59,000 cfh, with the value of Pa being equal to 135. If transmission pressures are involved and flows are in Mcfh, main number 20 carries 590,000 cfh and $P_1^2 - P_2^2 = 13{,}500$.

Each of these interpretations is based on a particular set of A factors; a different set of A factors would result in a different interpretation.

The minus sign for main number 22 indicates that the direction of flow has changed during the progress of the problem and is now opposite to the direction assumed. The pressure drop in main number 25 was less than 0.005-in. wc, and was rounded off to zero.

Fig. 5 is a flow chart of the punching routine.

• Main data punch-out and reload

At any time during a problem the values of AL and Q as stored on the drum may be punched out. The data may be reloaded later and the problem continued. Neither the punching of main data nor the punching of results affects the main data in storage; consequently, either may be punched at any time and the problem continued.

• Variations

Due to the flexibility of the program, one of the greatest advantages of the computer in network analysis is trying variations of a network problem to arrive at the optimum system improvement. It is a simple matter to vary network conditions and obtain as many variations as required. The usual changes that are made in a gas network are main enlargement, additional regulators, or additional mains creating new loops. These variations may be prepared for in advance by preparing the appropriate main and loop cards. A problem may be continued from a preceding balance after the necessary changes are made, or the problem may be started over from the original main data adjusted for the new conditions.

• Capacity

The loop balancing phase of the program requires the greatest number of instructions, occupying locations 1876 to 1999 inclusive. Storage for all other phases falls within these limits, leaving locations 0001 to 1875 for storage of main and loop data. The 0000 address is used for a stop instruction.

During loop balancing, the mains in any one loop are stored in groups of nine, beginning at 1875 and proceeding backwards. All the words on a loop card are stored even if the card contains only one main number. In addition, a zero is stored as a sentinel following the last main number. The remaining loca-

tions are available for main storage, one location for each main in the network. A zero must follow the last main data in storage, but this can be the same zero that follows the last main number stored from a loop card. If C is the number of cards required for the largest loop, and M is the number of mains in the network, the capacity may be expressed as:

$$9C + M + 1 = 1875$$

• Limitations

Both flow and length must be numerically less than 10,000 to meet the requirements of the main cards. In addition, the original assumption of flow should be low enough numerically so that adjusted values do not exceed four places during the progress of the problem. Since the length does not change, the numerical maximum of 9999 may be used unless the value of AL should exceed six places. The values of A that were used in the development of the program, placed the following limitations on L:

Pressure	*Pipe Size, in.*	*Maximum Length, ft*
L. P.	2	2,701
I. P.	2	367
I. P.	3	3,257
H. P.	6	185
H. P.	8	869
H. P.	10	3,016
H. P.	12	7,500

Since the values of L and Q may be expressed in any convenient units, such values may be altered by a power of 10 to bring them within range. All values in any one problem must, of course, be consistent. An isolated case of a main that exceeds the maximum length may be remedied by dividing it into two or more sections.

A stop is provided in the event that AL exceeds six places or Q exceeds four places during the course of the problem.

• Summary

Use of a computer does not resolve all the difficulties connected with network analysis. The preliminary preparations must be made with extreme care, this being just as important if not more important than when other methods are employed. An accurate map of the network and accurate load data are very important and sometimes hard to obtain.

Neither is the program presented here the answer to all network analysis problems. No provision has been made for handling systems where pressures differ at sources of supply, although this situation can be handled by setting up certain artificial conditions. The program does not account for compressor stations in a transmission system. Certain factors, notably supercompressibility, are neglected.

In our particular case, however, these considerations are of minor importance since we have no compressors, supercompressibility can be neglected, and varying input pressures are of minor importance. The entire transmission or intermediate feeder system, or any major portions of our low pressure distribution system can be analyzed as one problem. The effect of any number or combination of system improvements can be investigated by simple changes or rearrangement of main or loop cards. Actual computing time is short. It has been found that overall machine time may be estimated by allowing about one minute for each loop involved in the problem. Finally, the results may be printed as a clear, concise, and permanent record.

This program provides a simple, rapid, and flexible method of high capacity for analyzing gas networks. It is especially valuable in investigating possible improvements, and makes possible the analysis of networks for which manual solutions are impractical.

APPENDIX

• *Formulas*

The actual formulas used in the development of the program are as follows:

Low pressure: The Spitzglass formula.

$$Q = 3550K\sqrt{\frac{h}{SL}}$$

where Q = flow in cfh
K = a constant for a particular diameter main
h = pressure drop in inches of water
S = specific gravity, air = 1.0
L = length of main in feet

Squaring and rearranging,

$$h = \frac{SLQ^2}{(3550)^2 K^2} = ALQ^2$$

that is,

$$A = \frac{S}{(3550)^2 K^2}$$

The specific gravity can be assumed to be constant in any particular problem, and in this case the value 0.63 was used. As an example, the value of A for 6-in. pipe (K = 68) becomes,

$$A = \frac{0.63}{(3550 \times 68)^2} = 1.0811 \times 10^{-11}$$

Intermediate pressure: The Spitzglass formula.

$$Q = 4830K\sqrt{\frac{Pa}{SL}}$$

where $P = P_1 - P_2$ = pressure differential, psi.

$a = \frac{P_1 + P_2}{2}$ = average pressure, psia.

P_1 = initial pressure, psia.

P_2 = terminal pressure, psia.

whence $P_a = (P_1 - P_2)\frac{(P_1 + P_2)}{2} = \frac{P_1^2 - P_2^2}{2}$

other units as before
Squaring and rearranging,

$$P_a = \frac{SLQ^2}{(4830)^2 K^2} = ALQ^2$$

$$\text{and } A = \frac{S}{(4830)^2 K^2}$$

with S = 0.63 and for 6 in. pipe,

$$A = \frac{0.63}{(4830 \times 68)^2} = 0.584021 \times 10^{-11}$$

High Pressure: The Weymouth formula.

$$Q = 18.06 \frac{T_0}{P_0}\left[\frac{(P_1^2 - P_2^2)\, D^{16/3}}{GTL}\right]^{\frac{1}{2}}$$

where D = internal diameter of pipe in inches
T_0 = standard absolute temperature in degrees F.
T = absolute temperature of flowing gas in degrees F.
P_0 = standard pressure, psia.

other units as before
Assuming,

G = 0.63
T_0 = 60 + 460 = 520° F.
P_0 = 14.73 psia.
T = 50 + 460 = 510° F.

$$Q = \frac{(18.06)\,(520)}{(14.73)}\left[\frac{(P_1^2 - P_2^2)\, D^{16/3}}{(510)\,(0.63\ L)}\right]^{\frac{1}{2}}$$

Squaring and rearranging,

$$P_1^2 - P_2^2 = \frac{(14.73)^2\,(510)\,(0.63\ LQ)^2}{(18.06)^2\,(520)^2\, D^{16/3}}$$

$$\text{and } A = \frac{0.00079045}{D^{16/3}}$$

For 6 in. pipe (D = 6.040),

$$A = \frac{0.0079045}{14640} = 5399.2 \times 10^{-11}$$

The factor 10^{-11} has been used throughout for the sake of uniformity and convenience.

• *Operation*

It is not necessary to clear the drum to zero. The console settings remain as follows throughout the problem.

Switches	*Settings*
Storage entry	70 1951 1901
Programmed stop	Stop
Half cycle	Run
Address selection	Anything
Control	Run
Display	LA, UA, D, or PR
Overflow	Stop
Error	Stop

With one exception all phases of the program return control to the console, making it possible, once the initial start has been made, to continue the problem or begin a new phase by depressing the "Start" key on the input-output unit. The loop balancing portion of the program ends with a stop instruction in location 0000, making it necessary to use the "Computer Reset" and "Program Start" keys in addition to the "Start" key.

• *Check card*

Two items on the optional check card, which is punched out for each loop, should be clarified. The number in word four, referred to as the "number of loops in problem," represents the total number of loops only after completion of the first iteration. During the first iteration this location is used as a counter to determine the number of loops in the problem.

The fifth word is referred to as the number of unbalanced loops, but this is true only for the last loop in each iteration. During the first iteration, no test for a balanced loop is made. Beginning with the second iteration, each time the first loop is computed the total number of loops in the problem is transferred to this location. Whenever a comparison of ΔQ and ΔQ_L indicates that a loop is satisfactorily balanced, the number is reduced by one. This item might better be described as the number of loops in the problem, less the number of balanced loops encountered so far in the current iteration.

A card to "suppress check punch" and another to "reactivate check punch" can be used at any time, the only provision being that it must not separate cards belonging to the same loop. Use of the "reactivate" card just before the last loop, and the "suppress" card just after the last loop will result in a check card being punched for the last loop only. The check card for the last loop of the last iteration is always punched, even though the "suppress check punch" is in effect at the time.

• *Shift card*

The last card of the punch-out deck is referred to as the shift card. There are eleven cards which are identical except for a shift and round instruction which varies from a 0 to 10 place shift. Choice of the proper shift card depends on the units of L and Q originally selected. *Table I* may be used to determine the proper card.

The numbers in this table represent the amount of shift in each case. Any row or volume in the tables may be extended in either direction for other values of Q and L, but the range included here should cover all practical cases.

In high pressure problems, the value of ALQ^2 must be multiplied by 100 to find $P_1^2 - P_2^2$. If greater accuracy is desired, an alternate set of shift cards can be used. A shift card from this set changes the program slightly so that load cards are punched instead of non-load cards. This allows ALQ^2 to be

APPENDIX . . . Continued

punched as a six place number equal to $P_1^2 - P_2^2$. If the special shift card is used the values in *Table I* must be reduced by two to compensate for the additional places.

• *Pipe resistance factors*

Table I is based on A factors of the form shown in *Table II*.

All factors are to be multiplied by 10^{-11}.

Other forms of the A factor may be used. For example in a low pressure problem in which no main is smaller than 8 in., the factors may be shifted four places to the left for greater accuracy. Then for 8-in. pipe A= .2606059316 × 10^{-11} and for 30-in. pipe A = .0004151690 × 10^{-11}. On the other hand, for a high pressure problem involving a 3-in. main all factors must be shifted two places to the right in order to accommodate the factor for 3-in. pipe, A = 200118.822. If such shifts are made, the shift values in *Table I* must be increased by one for each shift of one place to the left and vice versa.

TABLE I

Low Pressure. A in the form XXXX.XXXXXX times 10^{-11}

		Units of Q			
		Cfh	Xcfh	Ccfh	Mcfh
Units of L	ft.	9	7	5	3
	X ft.	8	6	4	2
	C ft.	7	5	3	1

ALQ^2 = h in form XX.XX

Intermediate Pressure. A in the form XXX.XXXXXXX times 10^{-11}

		Units of Q				
		Xcfh	Ccfh	Mcfh	XMcfh	CMcfh
Units of L	ft.	10	8	6	4	2
	X ft.	9	7	5	3	1
	C ft.	8	6	4	2	0

ALQ^2 = Pa in form XXXX.

High Pressure. A in the form XXXX.XXXXXX times 10^{-11}

		Units of Q			
		Mcfh	XMcfh	CMcfh	MMcfh
Units of L	X.XXX mi.	10	8	6	4
	XX.XX mi.	9	7	5	3
	XXX.X mi.	8	6	4	2
	XXXX. mi.	7	5	3	1

$$ALQ^2 = \frac{P_1^2 - P_2^2}{100} \text{ in form XXXX.}$$

TABLE II

Size, in.	*L. P.*	*I. P.*	*H. P.*
2	0370.142673	199.9546927	
3	0041.768531	022.5637689	
4	0009.491142	005.1272077	
6	0001.081100	000.5840210	5399.244105
8	0000.260606	000.1407818	1150.581276
10	0000.082072	000.0443359	0331.508697
12	0000.033292	000.0179847	0133.325912
14			0074.039840
16	0000.008112	000.0043823	0035.436624
18	0000.004604	000.0024872	0018.549053
20	0000.002784	000.0015040	0010.611198
22			0006.187470
24	0000.001172	000.0006333	0003.850404
26			0002.490702
28			0001.665120
30	0000.000415	000.0002243	0001.145081

• *Control panel*

The control panel wiring is quite simple. Load cards, identified by a 12-punch in column one, are read in as eight 10-digit words. Non-load cards are read in as 10 8-digit words. The board is wired so that an eight in position 10 of the punch area will cause a non-load card to be punched. An eight in position nine will cause a load card to be punched.

• *Read wiring*

RSU Sign, Jackplugged
First Reading, Column 1 to Load

Read Card C	to	*Storage Entry C*
CC 1– 8		Word 1, Position 8–1 respectively
9–16		Word 2
17–24		Word 3
.		.
.		.
.		.
.		(Standard 10 eight digit word entry)
Word Size Emitter	to	*Word Size Entry*
8		Words 1, 2, 3 · · · · · 9, 10

• *Punch wiring*

P + Sign Jackplugged
PSU Jackplugged
Control Information
Position 9 to Punch A (for 8 ten-digit words)
Position 10 to Punch B (for 10 eight-digit words)
RVC Jackplugged Off
PVC Jackplugged Off
Digit Selector
Digit impulse jackplugged to common
12 impulse to punch column split, 12-X

Storage Exit A	to	*Punch Card A*
Word 1, Position 10		Punch Column Split, 0–9 (Same as from Digit Selector)
Word 1, Position 9–1		Column 2–10, respectively
Word 2, Position 10–1		Column 11–20, respectively
Word 3, Position 10–1		Column 21–30, respectively
.		.
.		.
.		.
.		.
Word 8, Position 10–1		Column 71–80, respectively

Punch Column Split Common to Column 1, Punch Card A.

Storage Exit B	to	*Punch Card B*
Word 1, Position 8–1		Column 1–8, respectively
Word 2, Position 8–1		Column 9–16, respectively
.		.
.		.
.		.
.		.
.		.
.		.
Word 10, Position 8–1		Column 73–80, respectively

ACKNOWLEDGMENT

The author wishes to express his thanks to Dr. Paul Herget, Professor of Astronomy at the University of Cincinnati and Director of the Cincinnati Observatory, for his assistance in the development of the program presented here. ■

PART ONE OF A TWO-PART ARTICLE

CUSTOMER SERVICE

Minneapolis Gas Co.'s utilization department has a perpetual goal—customer satisfaction. Its function is to assure efficient, continuous and safe use of gas by all gas appliances. The department is considered both a mechanical and promotional arm of the company.

By PAUL W. KRAEMER, Manager of Utilization
Minneapolis (Minn.) Gas Co.

Training class in session. Instruction includes both lecture and work on models of controls or appliances.

GAS exclusive

THE description of any good service operation is not just the description of how a capable serviceman makes an expert mechanical repair. The expert repair must be but a part of a description of getting and holding customer satisfaction. Good service must include interest in the customer and the appliance dealer, the prompt correction of appliance failures, and the application of knowledge concerning current appliance failures to prevent similar future ones.

The Minneapolis Gas Co. service operation attempts to incorporate those three elements in proper balance as the best insurance for sales growth.

- **Company operation**

The Minneapolis Gas Co. serves the city of Minneapolis and 22 neighboring suburban communities. The appliances on our lines include approximately 200,000 ranges, 200,000 storage water heaters, 30,000 dryers, 15,000 gas refrigerators, 5000 incinerators, 150 Serval air conditioners and 170,000 house heating installations served through about 207,000 meters.

About 56 billion cu ft of 1000 Btu natural gas is sold per year with about 35 billion of that to residential customers. In the 400 square miles of area served there are about 1900 miles of main. Two-thirds of the meters are on low pressure mains, measuring gas at 6-in. wc. The other one-third are on high pressure mains with individual service regulators feeding at 6-in. wc.

There is no outside metering. However, we will have 300 trial temperature-compensated outside meter installations this year.

Gas is odorized with mercaptan type odorants. Gas in a large majority of the system is oil fogged all year and humidified in summer to reduce the flow of minute solids in the main.

Propane-air and oil gas are used for peak shaving.

There are four separate operating departments under a vice president of operations. They are production, distribution, metering and utilization. Some metering and utilization activities overlap in regard to personnel use. This will be clarified in the following discussion.

• Utilization department organization

The utilization department serves the function of assuring efficient, continuous, and safe use of gas by all gas appliances. It is both a mechanical and promotional arm, for customer satisfaction is the perpetual goal and the purpose of any of our activities.

Within the utilization department are five interrelated departments.

The principal responsibilities of each of those departments:

1—Appliance installation department.
2—Customer order department.
3—Service department.
4—Training department.
5—Utilization engineering.

The meter installation section of the metering department is also a related part of some customer service activities.

Appliance installation department

1. Delivery, installation, and adjustment of appliances merchandised by our company. We do not sell space heating appliances.
2. Installation and adjustment of ranges and refrigerators sold by all dealers on a dealer co-op plan.
3. Major repair of appliances, refrigerator-unit replacement, and the repair of vents or chimney liners on orders taken by the service department.
4. Inspection and cleaning of gas boiler installations at regular intervals.
5. Service of appliances as required during peak service periods in assistance of service department.

Meter installation department

1. Installation and change of regulators and meters.
2. Completion of service orders reporting leaks at the gas meter fit.
3. Lighting of appliances following a sectional gas interruption or during fall heating light-up periods as required in assistance of service department.

Service department

1. Service and adjustment for any customer service request.
2. Repair of appliances.
3. Inspection and cleaning of warm air heating installations at regular intervals.
4. Inspection and cleaning of gas refrigerators at regular intervals.

Customer order department

1. Receiving and dispatching of all customer calls relating to customer service work.
2. Maintenance of all customer order records and time and work records of customer service operations.
3. Scheduling of service department shifts and required overtime.

Training department

1. Organization and instruction for training sessions for all customer service sections.
2. Processing of all written field observation appliance reports from customer service personnel and the forwarding of information as required within the departments and to distributors, manufacturers and the AGA.
3. Review and compilation of data on service callback orders to guide future training curriculum.
4. Securing and dissemination of all service literature.

Section of the customer order department office showing telephone clerks taking service orders from customers. Belt running between desks carries orders to checking desks, then to dispatcher's office.

Service dispatchers during day shift. Servicemen's routes and orders to be dispatched are filed in racks by district and subdistrict. Both telephone and two-way radio are used for dispatching.

5. Publication of additions and corrections to our gas service handbook.

Utilization engineering

1. Testing of all new models of appliances or controls as to construction, operation and serviceability together with a corresponding company report.
2. Aid and advice to all customer service sections on utilization engineering problems.
3. Review of all service analysis data for the purpose of advising on the elimination or promotion of various repair procedures or particular controls or devices.
4. Review of AGA research bulletins and other similar publications.
5. Standardization of service repair methods.

• General appliance service

Appliance service includes adjustments and repairs on operation, combustion, and venting parts of any gas appliances.

Services provided at no charge to the customer are:

1. All gas adjustments and electric component trouble shooting on all firm gas burning equipment.
2. Appliance turn-ons.
3. Scheduled periodic inspection and cleaning of space heating appliances and gas air conditioners to check for safe and automatic operation.
4. Scheduled periodic inspection and cleaning of gas refrigerators.
5. Replacement of defective parts provided by dealers on new appliances in warranty.

Services provided on a cost charge basis to the customers are:

1. Replacement of defective appliance components.
2. Repair of defective vents and gas piping.

At a nominal charge to dealers, the installation of ranges and refrigerators.

• Personnel—classification and hiring

There are two company-wide classifications of personnel—office workers and gas workers. Employees cannot transfer from one classification to another. The customer order department employees are office workers, all other customer service employees are gas workers.

The customer order department hires new personnel as clerks to do filing and other general clerical jobs. The clerks progress to telephone order clerks and then to dispatchers or service district clerks when openings appear. The usual progression time has been about two years as a clerk and about six years as a telephone order clerk.

The meter installation department and the appliance installation department hire all other customer service employees as mechanics' helpers. They remain as helpers for a minimum of two years. At the end of two years they must obtain a gas fitter's license through a written examination required by the City of Minneapolis. Those helpers with a license are eligible to become mechanics in their department as openings occur. Helpers are transferred between the meter installation and appliance installation departments as the need arises.

When new servicemen are needed a notice asking for voluntary transfer is posted for meter and appliance mechanics. The senior men who sign the posting, up to the number required, transfer to the training department for further training. After training each transfers to one of the seven service districts as a serviceman.

A serviceman with five years experience in the service department may become a Class A utilization mechanic by written examination. This is a merit promotion that has no relationship to the type of work he does. Every serviceman regardless of classification is expected to complete any service order of any nature on any appliance.

A higher classification of servicemen presently limited to four in number is that of industrial servicemen. These men specialize in the applications of gas and controls of industrial processing. Industrial servicemen are selected through a service department posting.

All applicants for customer service department

employment must apply to the company personnel department. Personnel screens the applicants for acceptable past histories and employment records. Those high school graduates that meet minimum screening standards are given a series of tests that determine reasoning power, mechanical ability, and certain other attributes. Applicants that meet minimum test standards must then complete a comprehensive personnel history questionnaire.

When new employees are required, the department head interviews applicants sent to him by the personnel department. He has copies of the applicant's history and test information. Those that he accepts and that meet minimum standards of a subsequent physical examination become new employees.

At the present time there are: 54 meter installation mechanics and helpers; 59 appliance installation mechanics and helpers; 180 service mechanics, and 41 customer order department clerks and dispatchers.

• Training

Every customer service employee receives training from the training department as well as from his supervisor.

The training curriculum is not fixed from year to year but changes with the needs. These changes are dictated by results of service analysis, new types of equipment, the number of new employees, and other changes. We may even interrupt one series of classes to insert another series if such timing is advantageous.

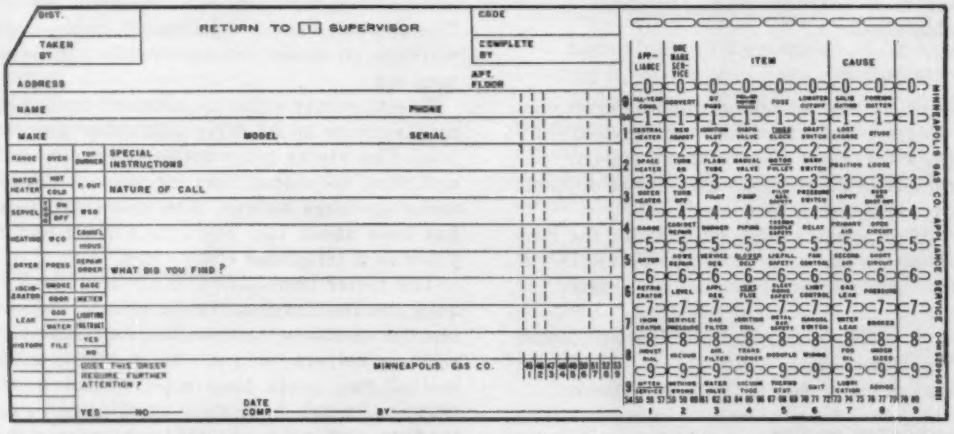
Each training class is usually limited to eight or less. That number is about the maximum which will allow for individual instruction and discussion of questions while still maintaining a teaching schedule.

New employees get about a one-week orientation session in gas company operations, combustion, procedures and other general information a few months after hiring. The delay is important to give the employee a chance to get acclimated to the job and so that he understands the significance of what he is taught. Before that time the supervisor supplies information to the new employee.

Mechanics who transfer to the service department are under the training department for three months engaged in a progressive classroom and field work training program. These utilization mechanics have been in customer service work for a minimum of two years and have received several other training periods during that time, and consequently are adept students. There is a one-week classroom session of lecture and practical trouble shooting on classroom models for each general type of appliance, followed by a one-week period to complete current customer service orders on that type of appliance. The heating appliance instruction covers three-week periods. When doing field work, men report to the training department at the end of the shift for additional information on the orders completed that day.

All servicemen get regular sessions of classroom training in one- or two-day periods at various times during the year as required by current needs. Nonlinting pilot installation technique, zone control heating systems, the study of all new or recent types of control devices, are example topics of recent servicemen schools.

Appliance installation mechanics attend the regular serviceman schools. Meter installation mechanics and customer order personnel attend sessions especially prepared for their benefit.



Service order form includes a mark sense section for service analysis. Serviceman fills out analysis section together with written report. Back side of card is lined for serviceman to write additional information.

• Service order completion schedule

The first key to customer satisfaction is to give the customer what he wants when he needs it. Of course, when a customer needs service and when he wants it can be different. Fortunately, the large majority of

customers are very conservative in their demands. When the house is cold the customer needs heat and we must see that he gets it. However, a thermostat a few degrees out of calibration is not important to a customer's immediate need even though he may want it repaired immediately.

The next important key in service scheduling is to keep promises. At the same time, if unforeseen occurrences interfere with promised service dates, the customer must be told about the delay as soon as possible.

All telephone service orders are coded for urgency of completion by the telephone order clerk at the same time he receives and writes the order. While there is a fixed completion schedule to guide the clerk, instances often arise when customer necessity or satisfaction is more important to us than a fixed schedule. Discretion of the clerk while in contact with the customer is important for customer satisfaction.

• Order completion codes

There are five order completion codes in two general classes: A and B. A orders by their nature dictate a maximum completion time, B orders may be scheduled for future completion.

A-1 orders include leaks, fire and fumes. They must be dispatched and executed immediately.

A-2 orders must be dispatched within two hours. A-2 orders include such as: heating appliance won't start or shut off, refrigerator not operating, or water heater cold.

A-3 orders must be dispatched before 8 p.m. or in the morning of the following day. A-3 orders include automatic oven won't come on, dryer won't come on, appliance conversion.

All B orders are those scheduled for completion on some future day. Actually, some orders which may appear to have an A classification may be a B classification upon agreement by the customer.

When a customer agrees to have the service performed on any day before a future date the order is coded B-1 with the final future date. B-1 orders may then be completed as the work load permits.

B-2 orders are those scheduled for completion on a given future day. The completion day is agreed upon by the customer and order clerk, and is one that fits our future order handling forecast.

Typical B orders are thermostat calibration, minor adjustments of burners and appliance repairs of minor importance to appliance performance.

Whenever a serviceman is carrying an order on its promised completion date and he sees that he will not be able to complete it, he reports the order back to a dispatcher. A dispatcher redispatches the order if possible. If a dispatcher is holding any promised order he will not be able to dispatch he calls the customer, explains and apologizes for delay, and sets a new completion date.

• Handling and completion of service orders

All service orders are received and dispatched from a central location. Servicemen, however, work out of three different locations.

Service transportation is by auto. There are no walking routes. About half of the servicemen use two-way radio equipped cars. The other half use any available telephone for regular reports to the dispatcher. Night, Sunday and holiday shift servicemen use radio cars only.

While a serviceman is working his shift, any order that is to be completed during that shift is dispatched to him by radio or telephone. Each serviceman reports to the dispatcher about five or six times during his shift. When he reports, he states his car number and the number and code of the incomplete service orders he is carrying. The dispatcher then gives the man additional orders or clears him according to the need.

When a serviceman reports to his service building location for his shift, he gets a work route prepared for him by a dispatcher during the previous shift. That route, when possible, is limited to two orders.

By limiting the number of orders on a man's starting route the dispatcher can exercise better control over the work load. This control allows the dispatcher flexibility in moving men to locations in proportion to the work load. He can also better see that promised completion dates are kept.

The dispatcher keeps a running record of each serviceman by means of a route card. There is a route card for each serviceman on which appears his name and car number, date, district, and the address and code of each order assigned to him. When the serviceman checks with the dispatcher the dispatcher timestamps the card and notes the number of incomplete orders and the number of additional orders the serviceman was given.

At the completion of the serviceman's shift, the original service orders are delivered to his service building. The serviceman writes on those original orders a report of the service call and fills in the corresponding service analysis section. If the serviceman thinks the service order requires futher special attention he so marks the order.

All service orders are sent back to the customer order department. Here they are checked against the route cards and read. Any order requiring further handling is held out and routed for completion.

Each day the completed service orders are sent to the tabulating department to record the service analysis data. Orders returned from tabulating are filed.

Our customer order filing consists of an envelope for each address. All service history for any address is kept in a corresponding envelope. ■

Next month Mr. Kraemer will discuss the service department's organization and supervision, and describe the scope of the company's actual service work.

Construction planning and forecasting

By JAY DAVIS JR., Vice President
Southern Counties Gas Co., Los Angeles

FOR several years Southern Counties Gas Co. has been fortunate to have a series of across-the-board procedure studies. During 1954 we got around to reshaping our plant budget routines along the lines of a management planning operation. The keynote was continuous fluid planning, not subject to the deadlines ordinarily associated with budget making, and not restrictive as to additions and changes that later could prove to be necessary. The general idea behind making the plant budget a management planning operation was a rough little gem dropped in our laps by Alex W. Rathe, professor at New York University, who said, "If your planning is good, control is no problem."

For those of you who are direct actionists, this idea will have to bounce around for awhile. The most direct way to cost improvement, at first glance, would seem to be more controls or control activity. Actually, it is possible to become so immersed in what is termed a control activity that it becomes a case of the tail wagging the dog. While the planning route to cost improvement may seem to be indirect, let me urge you to take a second look. The route can be quite direct.

If you buy this concept, you'll be living with a planning technique that is not easy. It has been a bitter pill for us more often than I wish to remember. Anyway, we at Southern Counties do believe that if our planning is good, control is no problem. Let it be added that we hope to continue to improve our planning, but being the fallible humans that we are, certainly we will always need a control activity. Our goal is to plan at the general office level in a fashion that sparks planning at the division operating level. This puts the planning operation into being near or at our first line management levels.

As we get into the details of the construction planning and forecasting routines, please remember that this is in the nature of a progress report. We hope to continue changing procedures as we learn how to do a better job. Our experience to date indicates that forecasting techniques are similar to the way designers define an airplane—an airplane is a device that almost does not work; if it does . . . it is obsolete.

About 50 per cent of our workload is tied to residential growth—and this type of growth is the hardest component of construction work for us to forecast. Some other substantial items such as replacement—or state highway relocations—are easy by comparison. Residential growth is difficult because its forecasting involves a great many unknown people, who, in turn, are faced with a great many unknown factors of their own. The decisions of these people are what we must follow in extending our gas facilities.

The first problem we bump into is in working with our own figures. This is the problem of defining the simple term "meter gain." Everyone feels that his company counts its meters forward and backward. But, with us at least, "meter gain" can still be a confusing term. For example: The normal reports that come across our desks have figures for "active meters" and for "connected meters." Naturally, active meters are the heart of the business when it comes to the payoff at the cash register. In construction forecasting, however, the figure we latch onto is "connected meters"—or is it?

Connected meter count can vary with company policy, as you know. Then we find another refinement. Do we use "net gain" or "gross gain" in connected meters? There is quite a substantial difference; so let me explain.

Suppose that one of our divisions has 200,000 con-

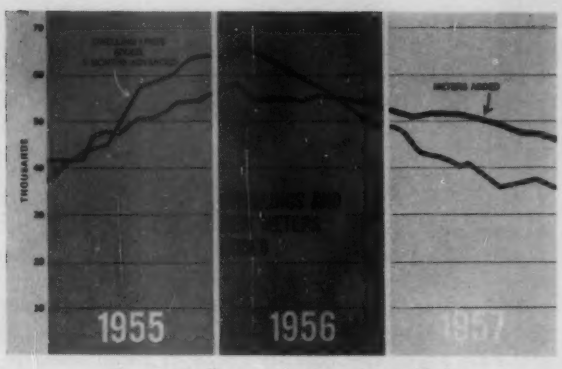


Fig. 1. Dwellings and new meters added.

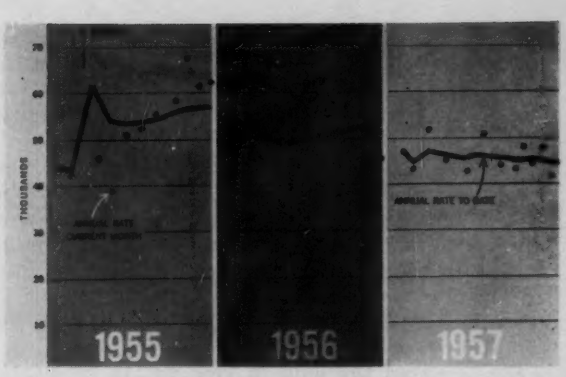


Fig. 2. New meters added.

nected meters as of April. Suppose, too, that the May report shows 203,000 connected meters. Simple arithmetic tells us that the net gain is 3000 meters. Thus our workload was 3000 meters to connect.

Right here we find that there may be a very large fly in the ointment. For example: A new freeway is bucking through the area. Let us suppose that 2000 homes are demolished and that all of the affected families relocate in the same area. We have lost 2000 meters and connected 2000 meters. This is a wash account and would not show up on our normal report of connected meters. However, our gross workload would be 5000 meters connected instead of 3000. There can be a sizable difference between gross and net gain—and that is why we have to dig out special data to give us "gross meter gain" for our forecasting.

There is still another wrinkle to be straightened out before we are on target. Connected meter figures are reported by meter-read cycle. Our construction dollars are reported by calendar month. This time difference between meters and dollars would be of little importance if the construction rate were constant. We find that our construction load normally hits some peaks and valleys, hence our reports are on a calendar basis for both meters and dollars.

All of the foregoing points up the margin of error we could and have run into in using meter statistics. In our shop we now distinguish between net gain in connected meters and gross gain by using the terms "new meters added" and "new meter connections." Hereafter, when speaking of meters added or gained, the reference will be to number of facilities actually installed in any given period.

We have spent many manhours trying to find a system that would give us a reasonable prediction of meter gain. What we needed was a method that our division people could use to forecast growth in terms of numbers and costs some 15 to 18 months into the future. For example: our forecast for 1959 will be firmed up by the divisions in September 1958.

We have found some good historical correlations between meter gain and business indices or disposable family income. We have not used the material for forecasting because (1) there is no real measure of the accuracy limits of business activity or disposable income estimates, and (2) product moment mechanics are not easy for everyone.

We did find that our division sales people gathered information on new construction starts from permit information and by field observations and contacts. This information on construction starts or dwelling units added predicted meters gained about five months later. We started to forecast by using this chart showing meters added and dwelling units added plotted five months in advance (*Fig. 1*).

This technique is like the plane: if it works—look out!—it may be obsolete. We found that the construction trades do occasionally build housing at a faster rate than the units can be sold. Tract development calls for the installation of mains and services ahead of paving for both the subdivider and

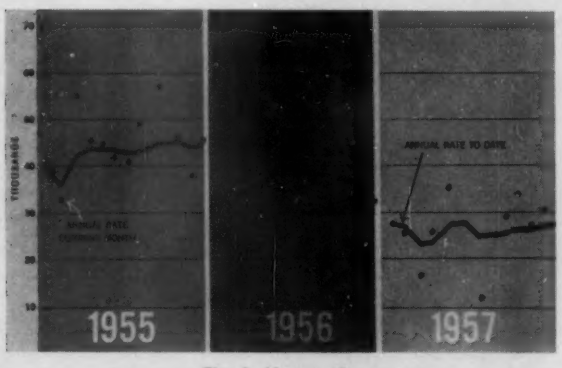


Fig. 3. New services.

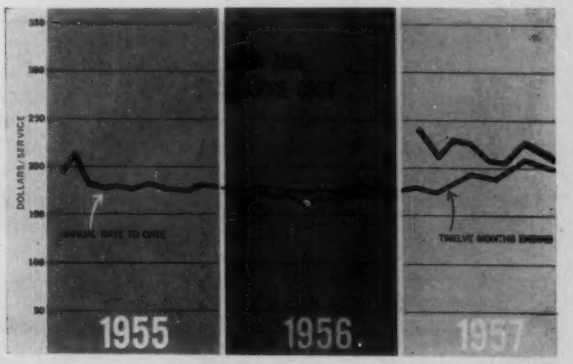


Fig. 4. Main and service cost.

the public's convenience and for the saving to the company. Last year's unit cost per meter may not be a fair target if the sale and occupancy rate is slowing down and the construction rate is increasing or holding firm.

One conclusion to be drawn from this chart is that the building construction during 1955 and a portion of 1956 outstripped the demand for housing in our service territory and that the market is catching up with the backlog in the years 1957 and 1958. This jibes with survey findings from other sources.

We took another cut at a forecasting method by using the following charts:

Fig. 2 shows the gain in new meters by month and year to date. The positions shown as circles indicate the annual rate of new meters connected as of each month, or in other words, 12 times the number of new meters added in a particular month. The solid line shows the annual rate to date. The position for February, for example, is the sum of new meters added in January and February multiplied by six. The position in March is the sum of January, February and March multiplied by four, and so on throughout the year. The solid line gives us an indication of the trend throughout the year. The circles or dots give us a measure of the current deviation from the trend.

Fig. 3 gives us the same information for services as was shown on *Fig. 2* for meters.

Fig. 4 shows dollars per service. This is actually the total dollars that we spend for both main and service work for growth divided by the number of services installed in the period. The chart shows the customary 12-month-ending figure as a dotted line and the annual rate to date figure as a solid line.

Fig. 5 shows the costs for meter and regulator assemblies. This includes the cost of meter, regulator, fittings, labor and equipment, and overhead costs for installing the meter set assembly in the field.

Fig. 6 shows meters per service. This is a plot of the ratio of meters per service with service installations advanced two months ahead of meter installation figures. Our construction scheduling is such that meters are installed on services about 60 days after the service installations. Meter per service ratios vary for a number of reasons, the most significant one being a shift in construction from single family housing to multiple family dwellings.

If you wish to compare any of these costs with your own cost figures, 80 per cent of the cost shown for Southern Counties will give you our approximate base cost without overheads. Your overhead figures may not be the same as ours, but by taking 80 per cent of the costs shown here and adding your own overhead percentages, you will arrive at reasonably comparable costs.

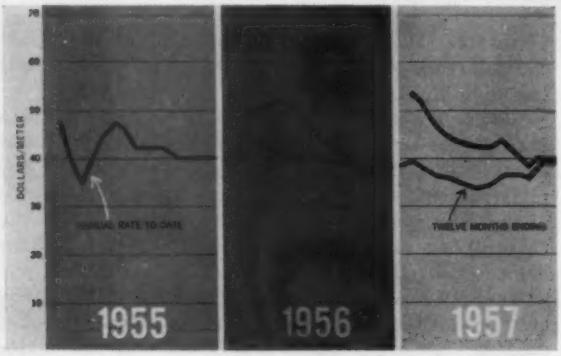


Fig. 5. Meter costs.

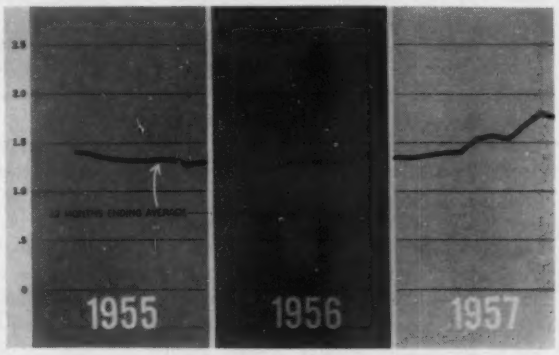


Fig. 6. Meter per service ratio.

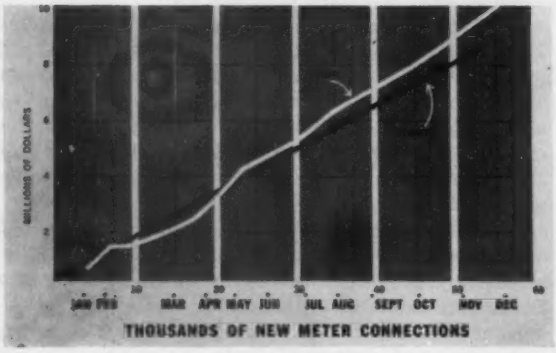


Fig. 7A. Growth—1955 budget.

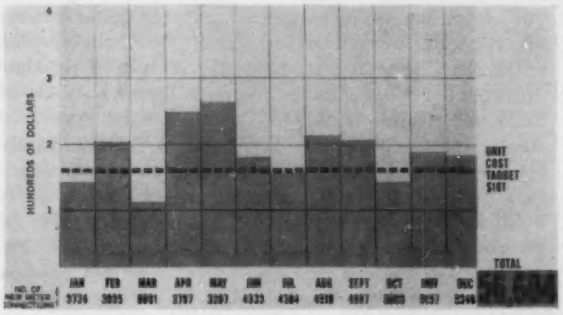


Fig. 7B. Growth—1955 budget. Monthly unit costs.

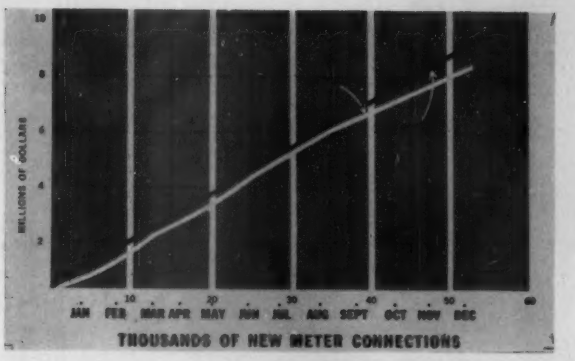


Fig. 8A. Growth—1956 budget.

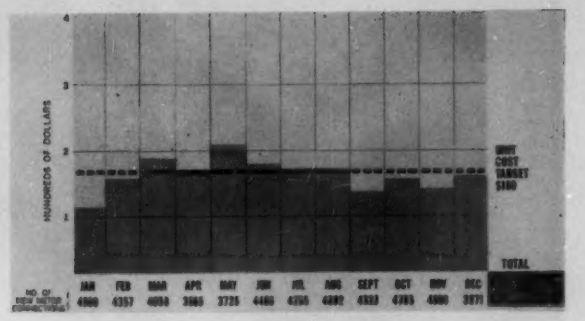


Fig. 8B. Growth—1956 budget. Monthly unit costs.

These charts are our primary tools for the 15- to 18-month forecast of construction work due to growth. We use *Figs. 1 and 2* to estimate the number of new meters to be added. We then use *Fig. 3* to estimate the number of new services to be run. We use *Fig. 6* to estimate the number of meters per service. We multiply the number of services by the meters per service estimate and check the meter result against the meter estimate to see what degree of correlation we have between the estimates. There is nothing in this to say that the estimates are sound; they may correlate and they may all be wide of the mark. The check may produce a comfortable feeling, but the betting odds are still good that actuals will have some variance or deviation from the estimates.

Our programming continues on down to sizing the backlog of work behind each crew. Let's skip over the details on lead time and job planning and leave them for a future presentation.

The end result of any planning activity should be some measure of what is happening to operations. Our reports for the years 1955, 1956, and 1957 look like this:

Figs. 7a and 7b: In 1955 our target was $161 per meter, and our results were $178 per meter. We estimated a gain of 54,000 meters, and actuals were 56,684 meters.

All of the charts shown are system summaries. What we actually use are charts for each division, both for planning and reporting of actuals.

Figs. 8a and 8b: In 1956 our target was $169 per meter, and actuals were $160 per meter. We estimated a gain of 53,000 meters, but added only 51,965.

Figs. 9a and 9b: In 1957 our target was $160 per meter, and results were $148 per meter. We started with an estimated gain of 56,000, and cut back to 50,000 early in the year. Actuals were 46,285 meters added.

As you can see from these results, we are not perfect, and certainly cannot even be classed as the polished planners we hope to become.

Let me recommend that you attempt to solve your control problems by improving your planning operations. Having indicated some of the things we use, let me mention two points not so evident. Our accounting and sales departments have been the principal partners in our development. Accounting prepares budget reports and charts, and produces crew production records for us, as well as the normally considered accounting functions of work order preparation and pricing. Sales has given us lead time so that orders can be prepared by accounting and still have time for construction to do a logical crew planning and scheduling job. My guess is that you will be well advised to interest your controller and your sales vice president in construction programming. ■

This article has been adapted from a presentation made by the author at the PCGA Distribution Conference April 29 at Tucson, Ariz.

Fig. 9A. Growth—1957 budget.

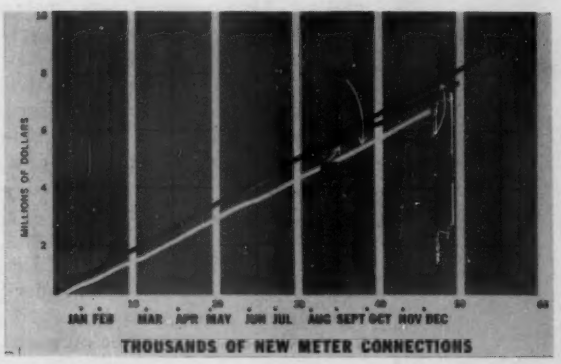
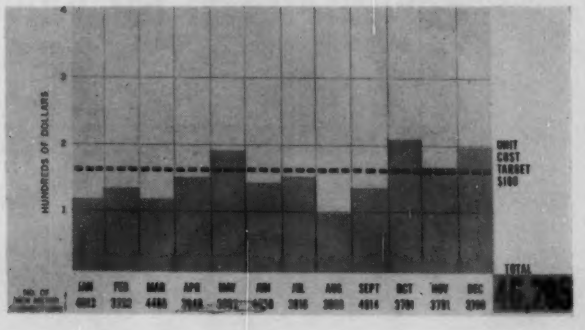


Fig. 9B. Growth—1957 budget. Monthly unit costs.



New material for valves, regulators and meters?

GASMEN have been taking a look at a comparatively new material that is in test phase for casting high-pressure gas meter and regulator bodies and parts. Field testing — though relatively young and not finally conclusive —joins with laboratory-produced experience to indicate a bright future for the new family of cast metals. It is trade-named Relianite and is a ductile iron.

Relianite is being produced and cast at the Reliance Foundry of the Reliance Regulator Division, American Meter Co., in Alhambra, Calif. Currently, castings are being made

Fig. 1. Slightly distorted but still pressure tight until gasket leak stopped hydrostatic pressure test on this ductile iron meter body at 484 psig after vigorous shock loading.

there for many products for sale to other manufacturers. And, some of the metal is going into the testing program for evaluation of its application to American Meter and Reliance Regulator products. The ductile iron may go into all American Meter products designed for working pressures of 100 psig and higher.

Ductile Relianite is currently being produced in four grades: R1 is designed for toughness, shock resistance and maximum machinability; R2 for heavy-duty machinery parts; R3 for outstanding wear resistance; and R4 for high temperature applications, up to 1600° F. General purpose of the metal family is to permit casting with the process advantages of cast iron for parts and products having advantages of cast steel.

One point should be clear from the first, the family of ductile cast metals is not particularly new. The material was invented in the Bayonne (N. J.) Laboratory of the International Nickel Co. during the early part of World War II. The foundy industry was well aware of it in 1948. A commercial heat of ductile iron took place in 1949. At present, over 300 companies in the free world are licensed to produce ductile iron.

Relianite is a variation by American Meter Co. of the new metal family developed by International Nickel. However, heats of Relianite were taken during 1955, so its newness is not too current. It is new to the application of castings to produce valve, regulator and meter bodies for the gas industry and parts of this equipment so basic to it.

A variety of metals have been used for the production of such equipment. Tinned steel, cast steel, pressed steel, aluminum, cast iron, forged steel, etc., have all been used and probably will be continued to be used. But as the technical era

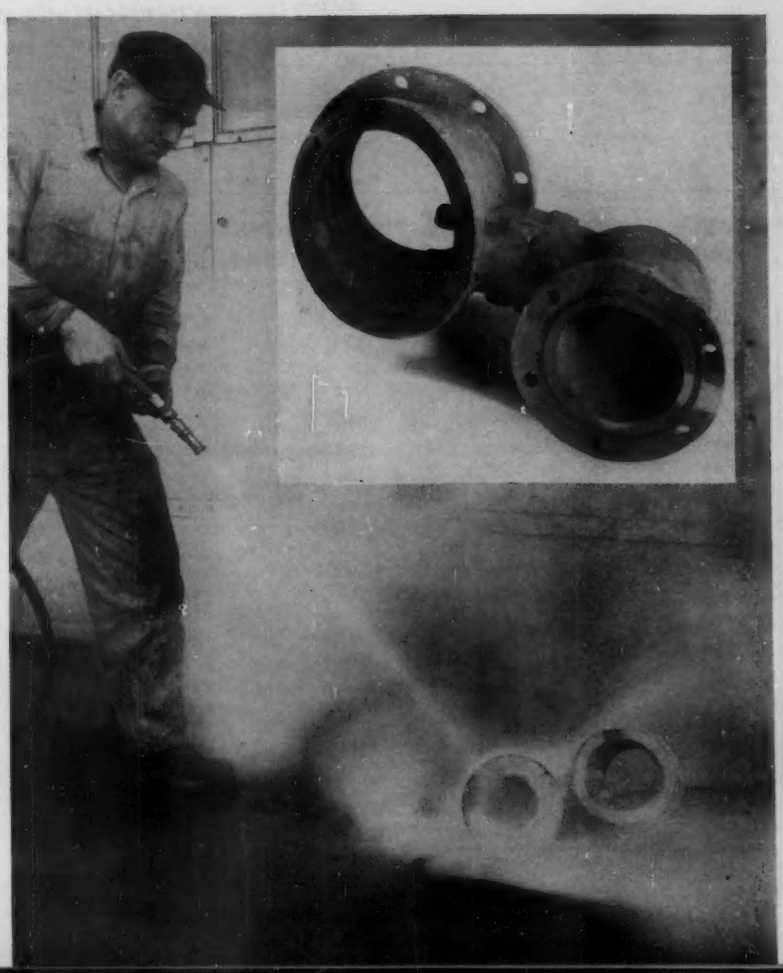
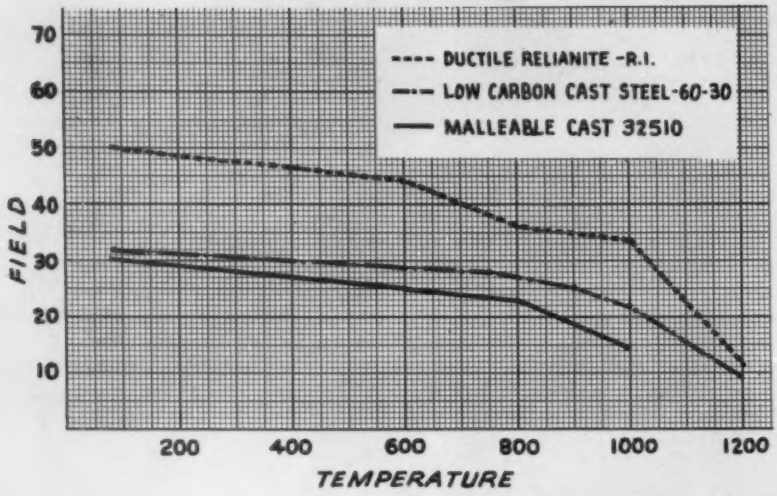


Fig. 2. Heated to 1200° F and cooled with hose stream, this regulator body casting was shock loaded. No fractures were experienced.



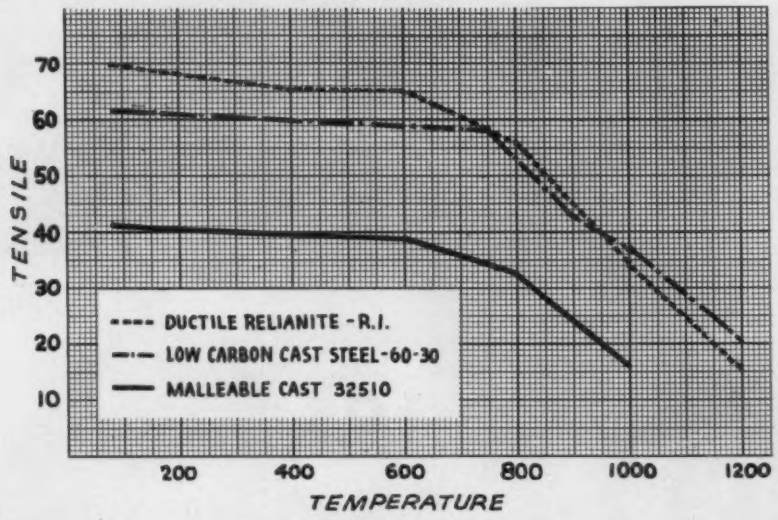


Fig. 3. Physical properties of cast ferrous metals at elevated temperatures.

TABLE 1—PHYSICAL PROPERTIES OF ANNEALED AND LOW TEMPERATURE BARS, DUCTILE RELIANITE, GRADE R. 1.

Tensile	Yield	Elong.	B.H.	R. Area
Annealed Bar 143-1				
71720 psi	52020 psi	18.5%	163	20.2%
Low Temperature Bar 143-2 Minus — 20 Below Zero				
82830 psi	59600 psi	18.0%		21.2%
Annealed Bar 134-1				
70560 psi	52790 psi	18.0%	179	22.8%
Low Temperature Bar 134-2 Minus — 40 Below Zero				
76260 psi	57830 psi	18.0%		22.07%
Annealed Bar 50-1				
68560 psi	51550 psi	22.0%	167	21.1%
Low Temperature Bar 50-2 Minus-60 Below Zero				
76280 psi	53570 psi	23.0%		21.9%

Test Made by California Testing Laboratories, Los Angeles Calif.

becomes increasingly effective in North American industry, special materials and products emerge that offer great potential advantages to specific applications.

Take meter bodies for instance. Gas meters are always getting hit by cars, trucks or what have you. They always will. Look at *Fig. 1*. This meter body cast from Relianite was hydrostatically tested at 1000 psig and showed no leaks. Then, a 2400-lb ball was dropped on it from a height of 20 ft. This shock test was repeated. The meter was given another hydrostatic test and held pressure until 480 psig was reached. The leak turned up at the inlet gasket; there were no leaks or fractures in the casting. This was true in spite of the fact that the shock test did slightly distort the body casting.

Or, take a look at *Fig. 2*. This regulator body was heated to 1200° F and then quenched to atmospheric temperature as shown. Then, they dropped the ball on it twice—2400 lb from 20 ft. Again, slight distortion of the casting but the metal didn't fracture. It may be that the gas industry can use material like this for some of its basic equipment that is subjected to damage from natural and man-made sources.

Ductility is imparted to this cast metal because the International Nickel researchers found that a small amount of magnesium properly added to irons converts graphite flakes of the irons to a spheroid-

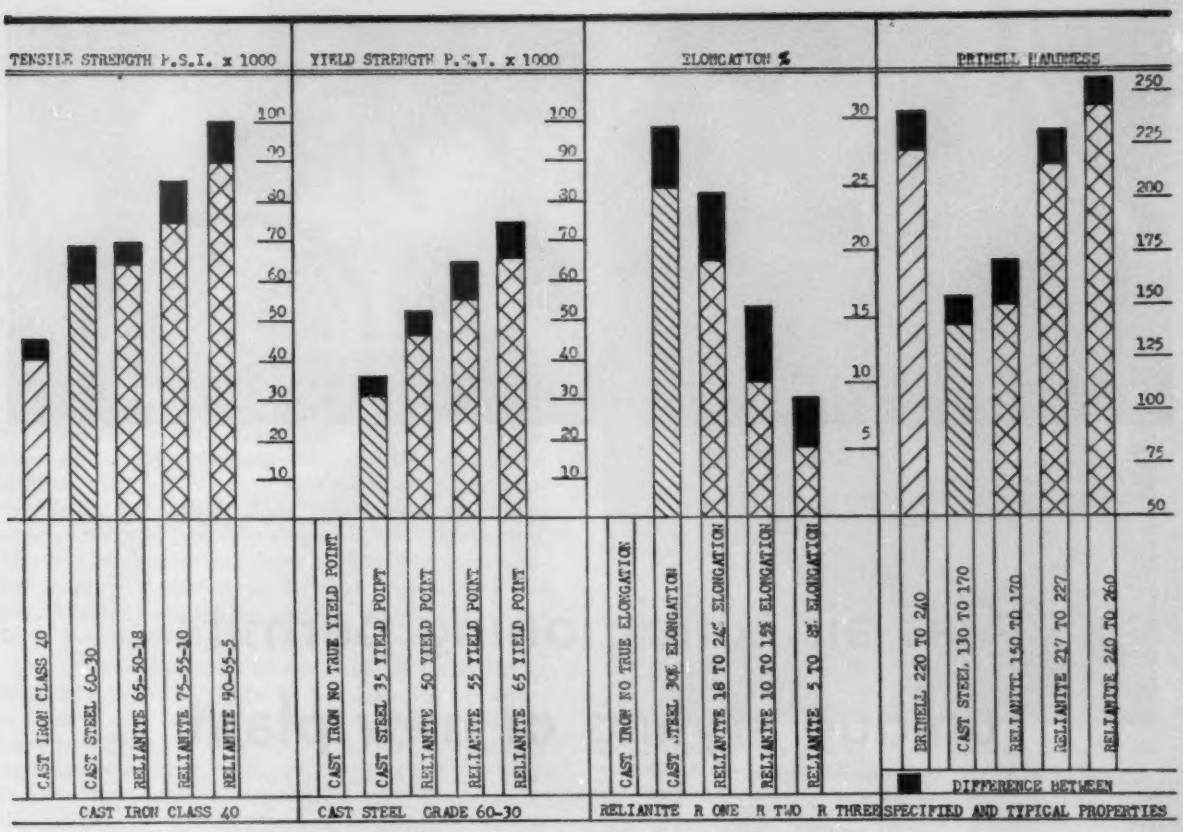

TENSILE STRENGTH P.S.I. x 1000
YIELD STRENGTH P.S.I. x 1000
ELONGATION %
BRINELL HARDNESS
CAST IRON CLASS 40
CAST STEEL 60-30
RELIANITE 65-50-18
RELIANITE 75-55-10
RELIANITE 90-65-5
CAST IRON NO TRUE YIELD POINT
CAST STEEL 35 YIELD POINT
RELIANITE 50 YIELD POINT
RELIANITE 55 YIELD POINT
RELIANITE 65 YIELD POINT
CAST IRON NO TRUE ELONGATION
CAST STEEL 30% ELONGATION
RELIANITE 18 TO 24% ELONGATION
RELIANITE 10 TO 15% ELONGATION
RELIANITE 5 TO 8% ELONGATION
BRINELL 220 TO 240
CAST STEEL 130 TO 170
RELIANITE 150 TO 170
RELIANITE 217 TO 227
RELIANITE 240 TO 260
DIFFERENCE BETWEEN SPECIFIED AND TYPICAL PROPERTIES
CAST IRON CLASS 40
CAST STEEL GRADE 60-30
RELIANITE R ONE R TWO R THREE

Fig. 4. Mechanical properties of typical metals and Relianite.

al form of solidification. This produced the ductility and also increases strength and rigidity of the part in the as-cast condition.

For a particular batch heat of 2200 lb of metal to be magnesium alloy treated, two cupola charges of 500 lb pig iron and 600 lb steel are tapped into a receiving ladle along with 10 lb Carb X and 5 lb soda ash at cupola spout.

Then, about 50 lb of INCO No. 2 Alloy (magnesium alloy) is spread into the bottom of a large ladle. When the metal is poured from the receiver into the large ladle the pyrotechnics are most spectacular. The still molten material is then reladled into the receiving ladle where 25 lb of ferro silicon is added. This, as mentioned, would be a typical heat. Other heats might well be different. For the heat described above, the as-cast physical properties were:

Tensile strength	98,970 psi
Yield strength	64,430 psi
Elongation	8.0 per cent
Brinell hardness	241
Reduction in area	5.7 per cent

After heat treatment—normalized at 1200° F—the physical properties were:

Tensile strength	78,060 psi
Yield strength	57,650 psi
Elongation	16.0 per cent
Brinell hardness	187
Reduction in area	11.2 per cent

As can be seen from test data, Relianite has been given some rugged routines to determine physical properties under different conditions. For instance, a sub-zero cycle test was performed. First, a test bar (No. 144-1 annealed) gave physical results:

Tensile strength	71,000 psi
Yield strength	51,000 psi
Elongation	20.5 per cent
Brinell hardness	179
Reduction in area	23.5 per cent

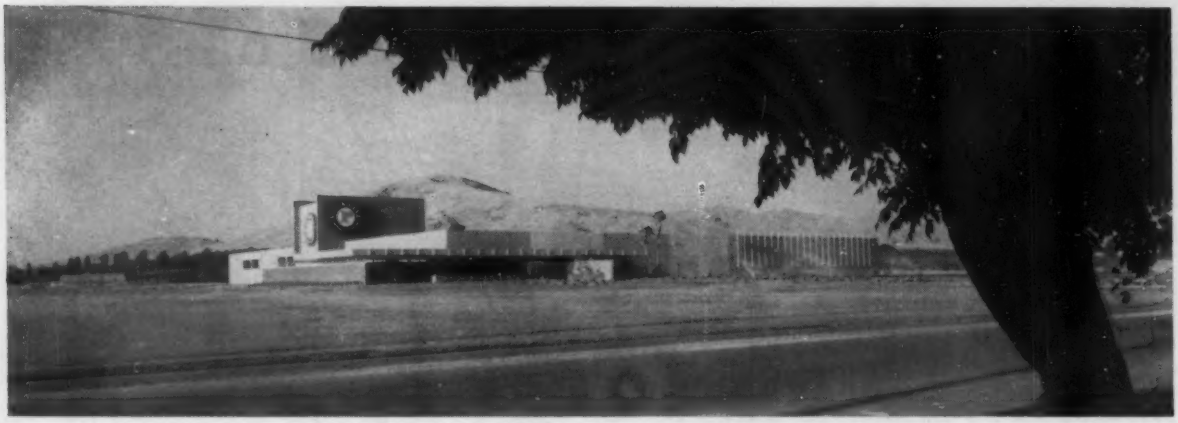
Then, another test bar (No. 144-2 annealed) was subjected to the cold cycle. The bar was held at –20° F for one hour; at –40° F for one hour; at –60° F for one hour. Then, back to –40° F for an hour; and another hour at –20° F.

The bar was broken at room temperature with the following properties observed:

Tensile strength	72,960 psi
Yield strength	54,080 psi
Elongation	20.5 per cent
Brinell hardness	179
Reduction in area	20.4 per cent

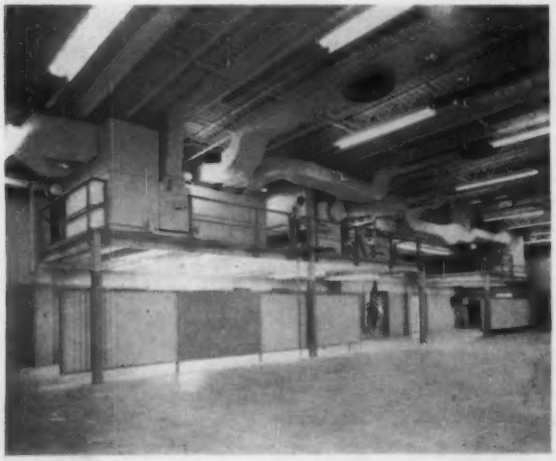
Further data on properties at low temperatures and at elevated temperatures are shown on *Figs. 3 and 4, and Table 1.* Tests were made by the California Testing Laboratories, Battelle Institute, and Steel Founders Society.

Reliance valves, Reliance gas regulators, and American Meter gas meters and products have been made from Relianite and are in the field for testing. It is early to predict ultimate application to gas products of American Meter. But, current results point to an optimistic future for the material in the gas industry. ■



Gas air conditioning permits unique styling of new plant

STRIKING architecture is an advantage of air conditioning not so often cited as increased employee efficiency and morale. But a new Rockwell Manufacturing Co. plant at Porterville, Calif., air conditioned throughout with gas-fired equipment, shows how air conditioning can help the architect create a distinctive building. The simplicity of design, made possible by the air conditioning system, gave architects Walter Wagner and Partners, Fresno, unusual opportunities to use form, color and textures to create an impressive western headquarters for the Pittsburgh-based company. Air conditioning also permitted reduction of basic construction costs.



Air conditioning equipment is located on balcony at one end of plant, adjacent to offices.

The new plant, just outside Porterville, about halfway between San Francisco and Los Angeles, will be used for the repair and assembly of Rockwell meters and valves and for warehousing of Rockwell-Delta power tools for the West Coast area. It is situated in the foothills of the Sierra mountain range in rocky, barren terrain. Its low, rectangular shape, painted to blend with the desert floor, stands out in the natural beauty of its setting without appearing obtrusive.

Air conditioning permitted use of simple, windowless, tilt-up slab walls. Pouring the walls on the ground eliminated 90 per cent of expensive forming required for poured-in place walls and eliminated need for a finish coat of concrete. The slabs are painted tan and brown in alternate pairs to blend with the dominant landscape colors.

Putting soldering furnace flues on the outside of the building also cut construction costs and contributed to architectural styling. Outside installation reduced the load on the air conditioning equipment. Painted a bright orange and located at the far corner of the building, they break the long, low building lines and lift the perspective at the far end.

The only windows in the building are a narrow band around the outer office walls and the front of the reception room which is all glass.

A recreation patio, used during breaks and lunch periods, matches the outdoor living settings of many California homes. Making good use of the mild climate of the area, it not only cost much less than an indoor cafeteria, but provides a welcome break in the workers' day spent within windowless walls—the only disadvantage of air conditioning. It is shielded from the sun by an overhead vined trellis and from the road by a flagcrete stone wall.

The air conditioning that made the striking architecture of Rockwell's Porterville plant possible was a virtual necessity because the work done on delicate, heat sensitive meter components requires a dust-free atmosphere. The company has installed air conditioning, however, in every new plant or plant addition built since 1952. This policy was established after a study of the advantages of air conditioning. Gas-fired equipment has been used in every installation because Rockwell, as a major supplier to the gas industry, wanted to provide show places that prove the merits of this type equipment.

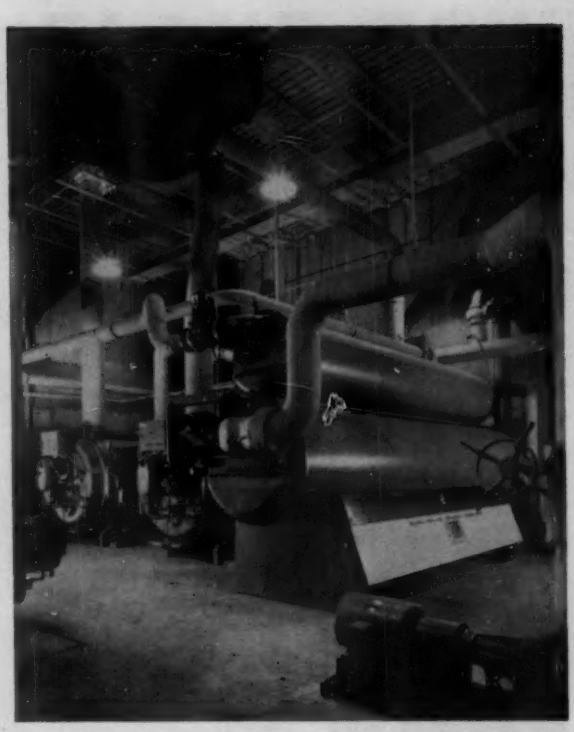
The Porterville plant, planned for air conditioning from its conception, is the first of Rockwell's air conditioned plants in which full advantage was made of the possibilities for striking architecture. Experience with five other air conditioned facilities has, however, proved the worth of industrial air conditioning. Elimination of wide fluctuation in temperatures of tools, fixtures and parts to be machined has resulted in better quality. Elimination of rusting has protected inventory and equipment. Use of windowless walls has added 5 to 10 per cent in usable floor space by eliminating need for aisles next to the walls. Cost of window maintenance is also saved and the lighting systems, independent of outside light, are better engineered.

Advantages in gas-fired equipment have also become apparent. Although electrical air conditioning units cost less, the heavier switch gear and transformers required make their installation cost greater. Operating costs are also lower than for electrical equipment and it is easier to combine heating and cooling systems where gas is used.

At Porterville, two gas-fired package boilers, rated at 15 psi and 4180 MBtu/hr, generate steam for cooling or heating. There are two air conditioning units, one 335-ton unit for the plant and one 30-ton unit for the offices.

Steam or chilled water is piped to air-handling units suspended from roof supports in the plant. They draw air directly through the roof. Dovetailing these units in the roof structure was another saving provided by designing air conditioning and the building structure as an integral unit. Ceiling height was maintained at the required 15-ft minimum without actually raising the height of the roof.

The offices are cooled or heated by a combination of radiant piping and forced air. Conditioned air is fed directly through perforated metal ceiling pans suspended from the radiant piping above. ■



Two gas-fired boilers with an oil standby setup, gas absorption air conditioning system and compressors are located in boiler room. All pipe is color coded for easy identification.

Operations for repair and assembly of meters and lubricated plug valves require straight line production and clean, neat working conditions.

GAS ASSOCIATIONS

Canadians plan $150,000 advertising program

A $150,000 advertising program to help sell gas appliances and commercial and industrial gas equipment in Canada has been proposed by the Canadian Gas Association. Initial outline was presented at the CGA's public relations and sales promotion workshop held recently in Vancouver.

Known as PAM (publicity, advertising and merchandising), the program has as its objectives: (1) Building consumer confidence in gas; (2) Creating favorable public awareness that the association and its members are aggressive, modern and capable.

Also proposed is an overall research plan. Among projects which would be examined by such a research committee are: fuller development of Dominion Bureau of Statistics data wherever it applies to the gas industry; the compilation of data supplied by association members; and the use of market surveys designed to probe public attitudes toward gas.

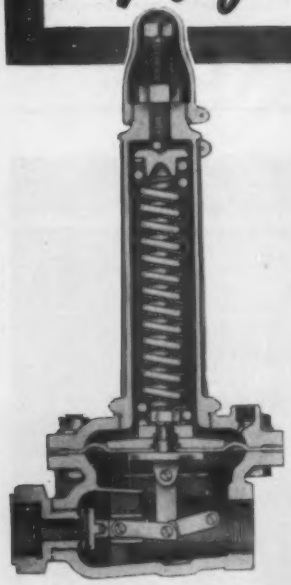
Winning companies in GAMA's 1957 PEP sales campaign were honored during the recent AGA sales conference on industrial and commercial gas held in Milwaukee. Winners in their individual classes were Oklahoma Natural Gas Co., Tulsa, over 100,000 meters; Piedmont Natural Gas Co., Charlotte, N. C., 25,000 to 100,000 meters; and Chattanooga (Tenn.) Gas Co., under 25,000 meters. Receiving the plaques are (from left): John C. Rasmussen, Chattanooga; Edwin Kahler, Piedmont Natural; and O. M. Heartsill Jr., Oklahoma Natural. At right is GAMA's managing director, Harold Massey, who made the presentation.

MidWest Gas Association elects new officers

Henry R. Slocum, Central Electric & Gas Co., Columbus, Neb., was elected president of the MidWest Gas Association at the group's annual convention.

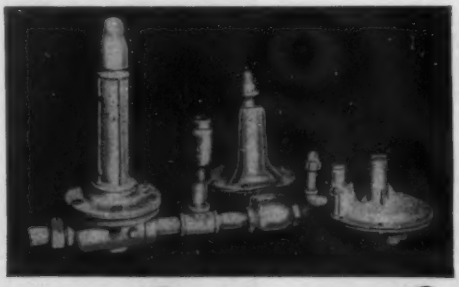
Serving with Mr. Slocum for the coming year will be R. S. Stover,

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN Reynolds...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

Marshalltown, Iowa, first vice president; Joe S. Mayer, Northern States Power Co., Minneapolis, second vice president, and E. E. Baxter, Branson, Mo., re-elected secretary-treasurer.

Association Notes

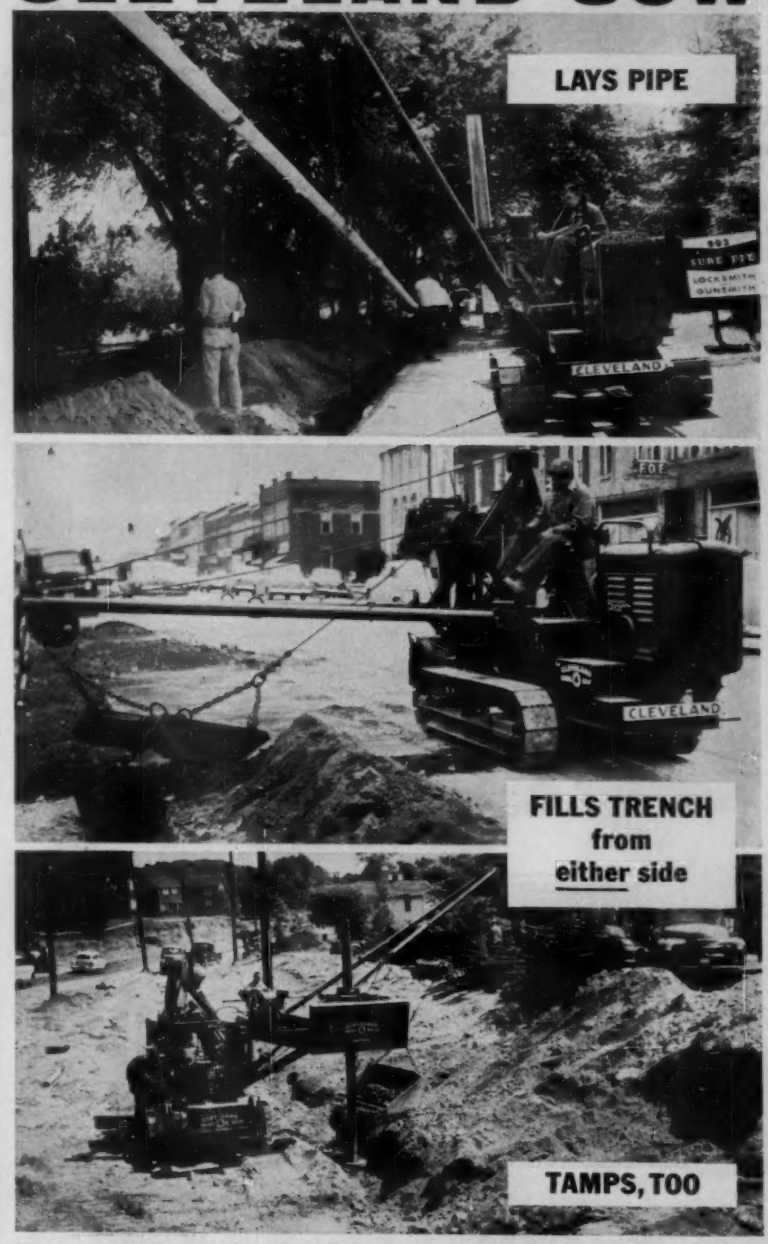
The Canadian Gas Association has moved into new quarters at 2532 Yonge St., Toronto, Ontario. Executive offices of the association, which now has a staff of 25, are on the second floor of the 7000-sq ft building. The Approvals Division offices occupy the first floor.

Clare D. Gard, retired chief process engineer for Union Oil Co. of California, is the winner of the 1958 Hanlon Award, highest honor in the natural gasoline industry and one of the ranking awards in the petroleum industry. Mr. Gard is the 22nd recipient of the award, conferred each year by the Natural Gasoline Association of America.

June 11-13 are the dates of the 1958 NEGA gas measurement and control school. The school will be held at the Worcester (Mass.) Polytechnic Institute. The 1958 curriculum will be on two levels—one for first-year utility representatives and the other for those who attended the first school held in 1957.

Past presidents of GAMA surround the incumbent president Clifford V. Coons, Rheem Manufacturing, during the association's 23rd annual meeting held recently in White Sulphur Springs, W. Va. Top row, from left: James F. Donnelly, A. O. Smith Corp.; T. T. Arden, Robertshaw-Fulton Controls Co.; Julius Klein, Caloric Appliance Corp. Bottom row: Stanley H. Hobson, Geo. D. Roper Corp.; Mr. Coons; and Sheldon Coleman, Coleman Co.

CLEVELAND 80W



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GAS · DISTRIBUTION NEWS

Commission warns against uncompetitive gas rates

Idaho's Public Utilities Commission believes that Cascade Natural Gas Corp. is entitled to rate relief in Lewiston, but denied the company's proposed boosts on the ground that Cascade could price itself out of competition with other fuels.

The PUC ordered the company to submit a new schedule of rates which would be more competitive.

Pointing out that the proposed increases would raise the costs of gas above the corresponding cost of fuel oil and coal, the PUC said "It would appear that the equivalent cost of gas is equal to or higher than fuel oil and exceeds coal approximately $10 per ton for heating purposes. It is apparent that the applicant has changed its theory of rate making from that of being a large volume seller at low rates to that of a low volume seller at considerably higher rates. . . .

"It is true that the applicant is presently operating at a loss . . . and should have rate relief, but we must not provide rate relief to such an extent that instead of assisting the applicant to improve its earnings position, we create a situation where it will find that it has priced itself out of the competitive market."

Artist's sketch of the multi-million dollar, 21 story East Ohio building now under construction in downtown Cleveland.

East Ohio plans move to Cleveland skyscraper

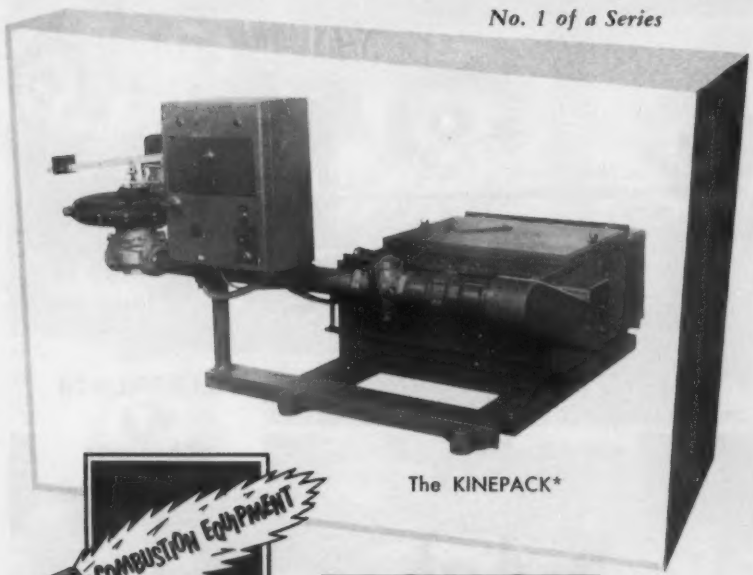
Cleveland's newest office skyscraper will be headquarters for the expanding business of East Ohio Gas Co. in northeastern Ohio. The multi-million dollar, 21-story building, to be named the East Ohio building, is scheduled for completion in January, 1959.

The builder is Tishman Realty & Construction Co., Inc. East Ohio will occupy the first eight floors and part of the basement under a 25-year lease. The ground level floor will include a gas appliance display center and an auditorium for gas appliances and home economics demonstrations.

Control valve study published

Written to help those who must keep in touch with control equipment used in process plants is a new book entitled "Control Valves," by C. S. Beard. The 222-page, pa-

No. 1 of a Series



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per-bound book also should be of help to engineers and operators who must select, apply, or service valves, actuators and process control equipment.

Additional information on the book is available from Instruments Publishing Co., 845 Ridge Ave., Pittsburgh 2, Pa.

American Natural must eliminate preferred stock

American Natural Gas Co. has been directed by the SEC to eliminate the $25 par value non-redeemable 6 per cent cumulative preferred stock from its capital structure.

(American Natural is the parent of Michigan Consolidated Gas Co., Michigan Wisconsin Pipe Line, Milwaukee Gas Light, and American Louisiana Pipe Line.)

The commission ruled that the voting power represented by this preferred stock is disproportionate in relation to that of the common stock and that it constitutes "an unfair and inequitable distribution of voting power" between the preferred and the common stock. A proposal of American to make purchases of its preferred stock from time to time was rejected by the commission.

Laclede adds 10,000 heating customers

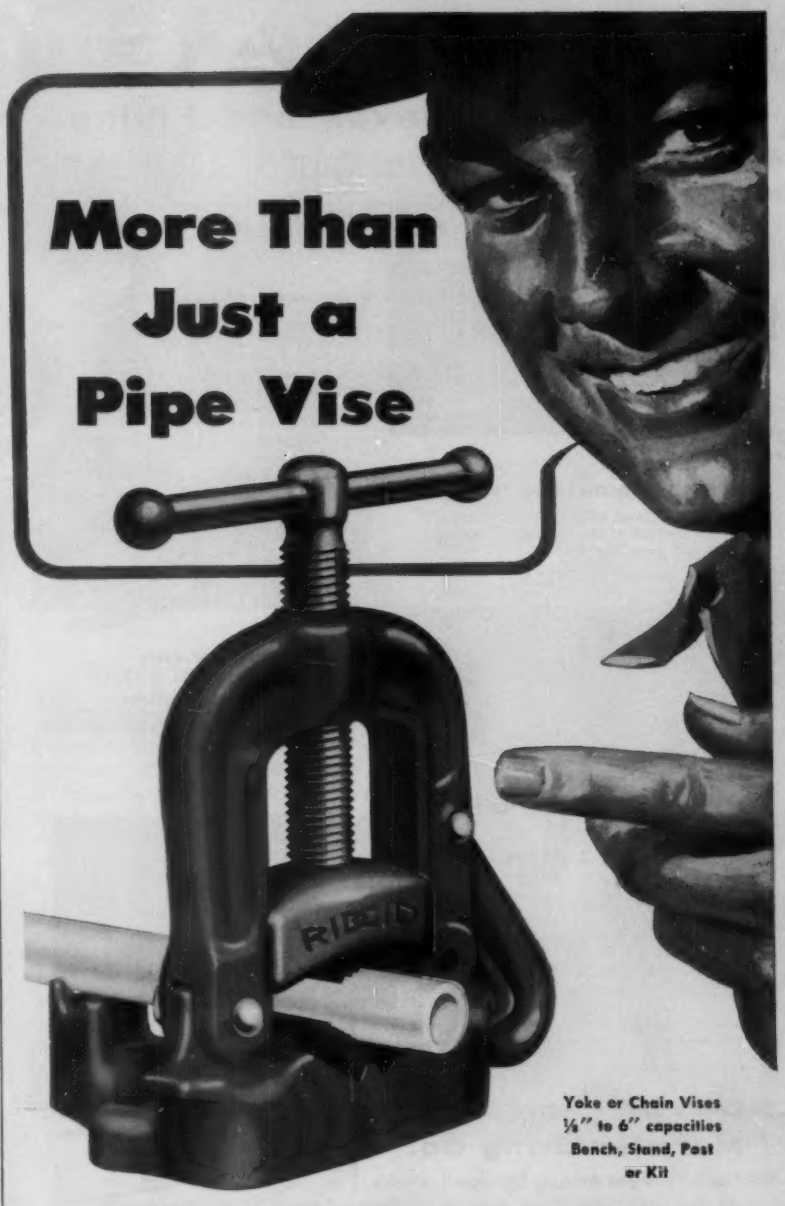
According to Laclede Gas Co., 10,000 more applications for gas heat in existing St. Louis homes have been approved. This brings to 15,000 the number of applications approved for existing homes this year.

The continuing success of Laclede's underground storage reservoir in north St. Louis county is credited with allowing the new installations. At the present time more than 5.25 billion cu ft of gas is in storage. During the cold period in February, Laclede officials say, more than half a billion cu ft of gas was withdrawn in amounts up to 48 MMcf/day—the largest use of storage so far during the two seasons the facility has been in operation.

11th underground storage area planned by Ohio Fuel

Ohio Fuel Gas Co. plans to develop its 11th underground gas storage area in Medina county.

Increasing demands will be met by the new storage area, and will provide a new source of winter sup-



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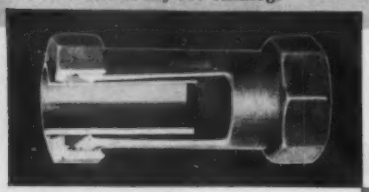

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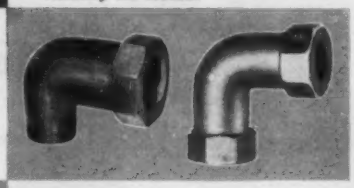
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.

COMPRESSION-END "ELLS"

Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

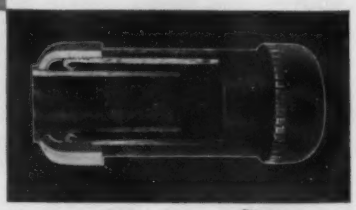


COMPRESSION-END SERVICE "TEE"

Full coupling depth. Special threads on male end prevent dropping into old hand taps.

NORMAC #50-A STEEL COUPLINGS

Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1¼" inclusive. 10" and special length centers available.



Normac also manufactures a complete line of red brass fittings in O. D. sizes: ⅝", ¾", ⅞", 1⅛", 1⅜" — and a complete line of insulated couplings and fittings.

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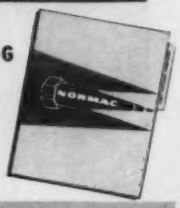

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ply for the rapidly expanding Parma-Lorain area in the northern part of the state.

The new area will have a storage capacity of 8.5 billion cu ft. Full development will include: drilling 72 new storage wells, conversion of 10 producing gas wells to storage, installation of more than 12 miles of new pipeline, and construction of a new compressor station and appurtenant facilities.

New reference gas made available

An improved testing procedure and a reference gas of certified heating value is now available to the gas industry.

The gas is available from the National Bureau of Standards as a result of a research and development project conducted by the AGA's research bureau. The gas

Users extoll virtues of air conditioners

Evidence of changing living habits when the home is air conditioned was given by some 25 southern California women who participated in an air conditioning forum held by Lennox Industries Inc. in Los Angeles recently. The forum was one of a cross-country series being conducted by the Marshalltown, Iowa, company.

One of the changes noted by the women was a move from outdoor living to indoor living with an outdoor atmosphere. The women definitely seemed to like the idea of outdoor cooking (barbecuing) inside, and on the hottest summer day this can be enjoyable with an air conditioned house.

Their children's health was one of the chief advantages claimed by the mothers in the group. Allergies, respiratory problems, asthma, sinus, all were helped by air conditioning. One young mother claims her greatest joy with her air conditioner was that her young children took longer naps with the house at a comfortable temperature. Another had nothing but praise because her house was so clean.

has a heating value close to that of natural gas, approximately 1000 Btu/cu ft at an accuracy of plus or minus 0.5 Btu.

The government bureau recently began supplying the reference gas to industry in standard "E" cylinders containing approximately 250 standard cu ft at an initial pressure of about 1900 psi. This amount is sufficient for approximately 200 recording gas calorimeter calibrations.

Whirlpool releasing gas refrigerator patents

Whirlpool Corp. has informed presidents of 18 firms manufacturing refrigerators that it is making available for licensing approximately 125 patents related to gas refrigerators and freezers.

Whirlpool's president, Elisha Gray II, said, "We intend, in the immediate future, to list in the U. S. Patent Office Gazette as available for licensing on a non-exclusive, reasonable royalty basis, absorption-type refrigeration patents that we acquired from Servel."

First production of RCA-Whirlpool gas refrigerators was scheduled to get under way last month, with maximum production due to be reached in mid-June.

Initially, five models will be produced: one 11-ft, two 10-ft, and 9- and 6-ft models. The Ice-Maker feature will be standard on the 11-ft and on one of the 10-ft models.

The new refrigerator will be introduced nationally in a multipage, full-color ad in *Life* Magazine the second week in July.

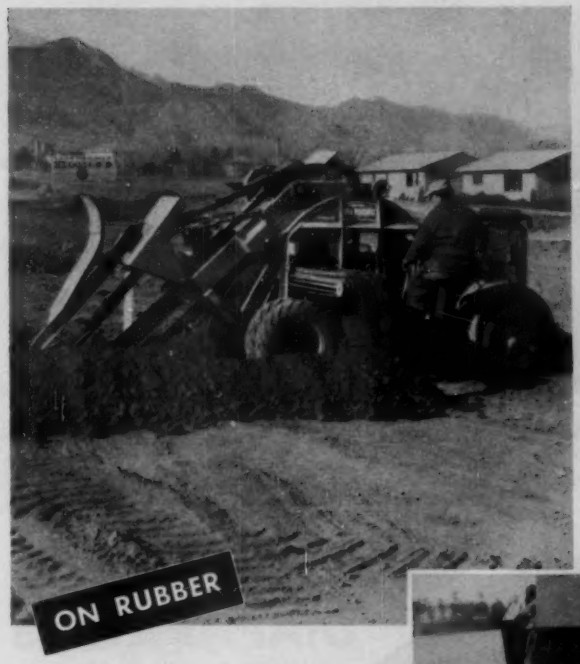
AGA Labs publish work on new incinerators

Design information for smokeless, odorless gas incinerators is contained in a recent bulletin (No. 78) issued by the AGA Laboratories.

Entitled "Design of Domestic Gas-Fired Incinerators for Elimination of Smoke, Odors, and Fly Ash," the bulletin presents design data and related information of interest to municipal authorities, air pollution control officials, gas utilities and equipment manufacturers.

Public Service seeks first rate hike in 37 years

For the first time in 37 years, Public Service Electric & Gas Co., Newark, N. J., is seeking a general rate increase.



NOW PARSONS® brings you a pair of small utility trenchers

Mobile as a truck, Parsons 88 Trenchmobile® steps up work schedules on widely scattered jobs. It drives around town from one assignment to the next at speeds to 12.6 m.p.h. On house-to-street service connections, pipeline reclamation, or mainline extensions, the 88 opens up to 14½ feet of trench per minute, 8 to 16 inches wide at depths to 5 feet. Positive down-crowd boom starts cut fast, holds accurate grade. It undercuts walks, curbs, cross-pipes — makes vertical set-ins. But that's not all, on many jobs, Parsons Trenchmobile — equipped with 6-foot blade (optional) — backfills its own trench.

Parsons little 77 Trenchliner® is not much wider than a yardstick, just 3 feet-8 inches wide to be exact. What's more it's only 5 feet 8-inches "low" with the boom in digging position. Weighs about 6500 lbs. for convenient trailer transport from job to job. Small in size but big in capacity, the 77 produces from 4.4 inches to 21 lineal feet of trench per minute, 6 to 18 inches wide, at depths to 5 feet. Its self-cleaning buckets are equipped with Parsons "Tap-In" teeth. Shiftable spoil conveyor is instantly reversible for controlled discharge. Better check what these small utility Trenchliners can do on your service lines, mainline extensions, etc. Ask your local Parsons distributor for a demonstration on your work, or write for literature.

Want more facts?

Mail to: PARSONS Company, Newton, Iowa (Division of Koehring Co.)

Send literature on: ☐ 88 Trenchmobile ☐ 77 Trenchliner

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news • *Continued*

The last increase in Public Service gas rates for any class of service was in 1946 and that request applied for building heating and large industrial and commercial purposes.

According to company officials, the new increase is needed to obtain operating revenues sufficient to meet expenses, taxes and fixed charges and provide a more adequate rate of return on the present fair value of the company's gas property.

Canadian Western meeting increasing peak demands

Canadian Western Natural Gas Co., Ltd., Calgary, plans to develop gas reserves in the Carbon area that ultimately will deliver up to 150 MMcf/day. The cost of the Carbon project, which will "provide ample gas to meet winter peak demands for many years in the future," is estimated at $9.3 million. Included in this is a 58-mile pipeline from the field to Calgary.

Canadian Western also has contracted with Alberta & Southern Gas Co., Ltd., for gas to augment its own supply. The contract gives Canadian Western a prior right over A&S export requirements.

Five-year appliance forecast: 57 million units

The residential market for gas appliances and equipment can yield sales of more than 57 million units during the next five years, according to estimates of the AGA's bureau of statistics.

The study shows that gas appliance and equipment sales in 1958 can reach 9.6 million units.

Market potentials for the years 1958-1962 indicate that the industry can sell 17.7 million new gas water heaters, 13.9 million kitchen ranges, 13.0 million space heaters, and 5.5 million central heating units.

Also, the gas industry can move 3.7 million dryers, 2.9 million floor and wall heaters, and a half million incinerators.

AGA forecasts growth over 13-year period

Between now and 1970, the gas utility and pipeline industry will spend more than $36 billion for construction, according to an AGA forecast.

Construction expenditures will reach an annual peak of $3.6 billion in 1970 when the industry will serve 43.7 million customers.

Other growth figures: 153 billion therms will be sold in 1970; revenues will total $10.7 billion; nearly 85 per cent of all residential consumers will use gas for house-heating, with some 33.6 million homeheating customers on the line; gross plant will be $49.3 billion; 858,000 miles of mains will be in use; transmission line mileage will total 260,000; distribution lines will reach 513,000 miles, and employment will reach 266,000 with a payroll of $2.6 billion.

South Carolina PSC okays Carolina Pipeline's plan

A $6 million transmission line has been approved by the South Carolina Public Service Commission. Carolina Pipeline Co. will build the line to serve Georgetown, Timmonsville, Lake City, and Kingstree.

Also covered in the commission's order was service to the towns of Lamar, Andrews, Myrtle Beach, Crescent Beach, Ocean Drive Beach, Conway and their surrounding territories if the company finds it "financially feasible."

Already under construction are lines to serve cities and towns in the York, Chester and Lancaster County Natural Gas authorities, and to Camden, Cheraw, Dillon, Bishopville, Marion, Mullins, Sumter, Darlington, Florence and Hartsville.

Carolina's president, John A. Warren, estimates the system will use about 7 MMcf/day, which will be supplied by Transcontinental Gas Pipe Line Corp.

Consumers plans 85-mile line

Consumers Power Co., Jackson, has asked the Michigan PSC for a permit to build an 85-mile 24-in. line from the Overisel gas field near Holland to Laingsbury.

John P. Simpson, Consumers' vice president, said the line will reinforce existing gas supply in the Ionia, Grand Ledge and Hastings areas and bring natural gas to Middleville. The line will also improve Consumers' service in the Lansing area.

Mr. Simpson said that eventually the company will convert the Overisel field to an underground storage field. The new line then will carry gas for storage in the

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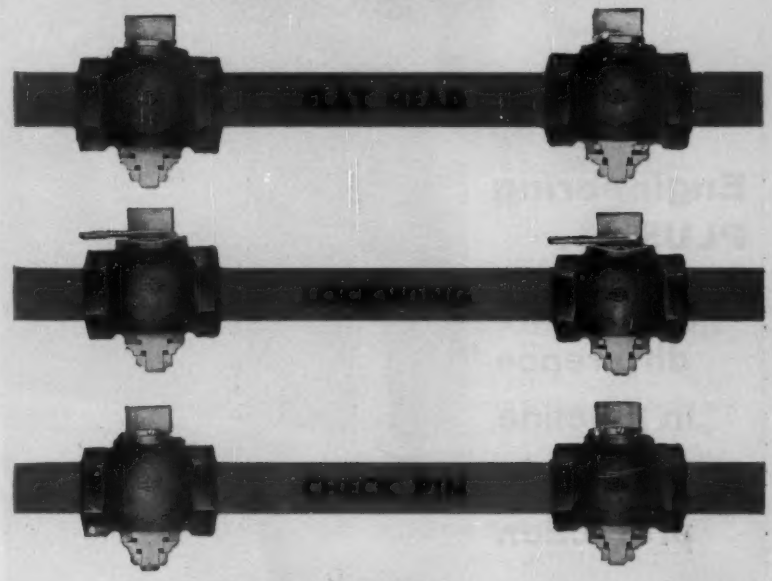
Iron Body with Brass Plug ... Black or Galvanized



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Quality Proven by Supplying the Gas Industry for Over 80 Years

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Another Hays First for Easy Handling ... Space Saving Storage

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ERIE, PA.

non-peak months and transmit gas from the field during peak winter months.

GAS • News Notes

Stockholders of Florence Stove Co., Kankakee, Ill., have voted to change the firm's name to Geo. D. Roper Corp. Florence and Roper merged in October, 1957. The change was made because a major portion of the company's brand-name gas range production will be marketed under the Roper label.

Robertshaw-Fulton Controls Co.'s fifth research and development center is slated for the town of King of Prussia, 14 miles from Philadelphia. Approximately $950,000 will be involved in construction of the center which will be devoted to seeking out advanced automatic control devices for use in home and industry. It will also engage in special developmental work under government contracts.

Allied Chemical & Dye Corp., New York, is changing its name to Allied Chemical Corp.

Carlon Products Corp., Cleveland, has acquired the Plastic Industrial Products Co. of Somerville, Mass. According to Carlon, Plastic Industrial will be the first flexible plastic pipe manufacturer in New England.

Transfer of Dominion Natural Gas Co. properties in Ontario to Union Gas Co. of Canada Ltd. has been completed.

John H. Carter Co., Fisher Governor Co. sales representative in Louisiana, has opened a new branch and warehouse in Lafayette, La.

The heating controls section of Robertshaw's Acro division at Columbus, Ohio, has been transferred to the Grayson Controls division at Long Beach, Calif. Fan and limit controls, thermostats, and gas valves go to Long Beach. The precision snap-acting switch line remains with the Acro division.

Anesite Co., Chicago, has named Line Material Industries, Milwaukee, as national distributor of Anesite plastic pipe and fittings. Anesite, operating plants in Chicago

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E. R. P. corrosion engineers check an exposed leak area. Here they correlate pipe potential and line current measurements for electrolysis.

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That's what makes the difference in E.R.P. cathodic protection: engineering when the cathodic system is designed; when it's installed; when periodic corrosion surveys are made to check for environmental changes.

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and Santa Barbara, Calif., has been selling through independent representatives.

Executive offices of the Siegler Corp. have moved to their new and permanent location at 610 S. Harvard Blvd., Los Angeles. The offices temporary location was at Siegler's Hallamore Electronics division plant at Anaheim.

Philadelphia (Pa.) Gear Works, Inc., is changing its name to Philadelphia Gear Corp. Russell C. Ball, president of the 66-year-old firm, said that the new corporate designation "more properly describes the company's activities in the mechanical power transmission field."

GAMA has protested a proposed excise tax change. The protest said, "The Gas Appliance Manufacturers Association, comprising 570 manufacturers of more than 95 per cent of the gas appliances and equipment produced in the United States, believe President Eisenhower's recent plea to industry to promote, sell and advertise its products more aggressively is seriously offset by the proposal of the Internal Revenue Service to reverse its long-standing policy with respect to application of the manufacturers excise tax to cooperative advertising allowances made by manufacturers to distributors and retailers."

Commissioner Norman P. Mason of the Federal Housing Administration urged those supplying the building industry to have inventories adequate to meet the anticipated upturn in housing. Addressing the annual GAMA meeting, Commissioner Mason predicted that "we will sell 150,000 more houses in 1958 than were sold in 1957." Suppliers who let inventories fall too low, he said, "will be unhappy people."

Mine Safety Appliances Co., Pittsburgh, has bought a controlling interest in Auer Co., Inc., one of Europe's leading manufacturers of safety equipment. The new facilities are located in West Berlin and Schwabisch Gmund.

National Cylinder Gas Co., Chicago, has changed its name to the Chemetron Corporation.

Capt. Matthew V. Carson, Jr., USN, has been named director of the Interior Department's Office of

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50% fewer working parts

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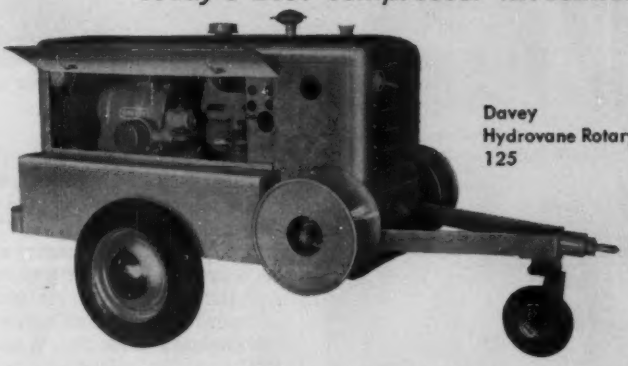
Davey Hydrovane Rotary

today's best compressor investment!



Davey Hydrovane Rotary 125

Take one quick glance at the new Davey Hydrovane Rotary. You'll note there are no complicated pipes, pulleys, tubing or plumbing.

Every part is readily available for inspection. Daveys can be serviced by any mechanic. No special tools—only pliers, wrench and screwdriver are needed.

Before you buy—see Davey. 50% fewer working parts means greater operating efficiency, reduced maintenance expense, longer life.

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Oil separator, relay valve, filter, shaft and pump are "easy-to-get-at".

It's a cinch to remove oil filter cover for cleaning.

Segmented rotor vanes can be easily inspected or replaced in the field...in minutes.

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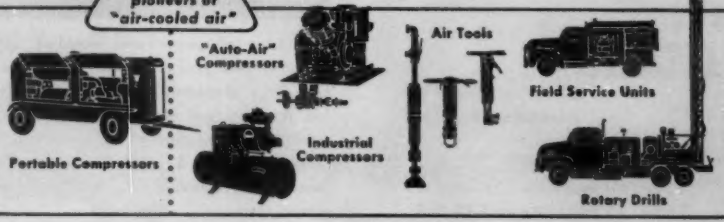

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Vulcan provides integrated research development and manufacturing facilities. This means complete quality control from raw material to finished product; assuring you that every diaphragm is made to strict specifications.

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news • *Continued*

Oil & Gas. He succeeds Hugh A. Stewart, who retired from the department in February.

C. Hubert Gregg reports that all Sooner Boomer rubber-tired pipelaying equipment will now be made by the Sooner Boomer Manufacturing Division, Oklahoma City. The equipment formerly was manufactured by Pneumatic Pipelayers, Inc.

Further expansion of Tex-Tube, Inc., Houston, has been announced by Charles A. Carter, president. A new division sales office has been opened in Tulsa. Manager is R. B. Wallace.

Stockholders of Spokane (Wash.) Natural Gas Co. approved the proposed merger of the company with Washington Water Power Co., also of Spokane. The merger also has been approved by the gas company and the Idaho PUC. It still must be approved by Washington Water stockholders and the Washington PSC.

Cleveland Trencher Co. has appointed two new distributors. They are: A. T. Green Machinery Co., Pittsburgh, covering several western Pennsylvania counties, and West Virginia Tractor & Equipment Co., Charleston, covering the state of West Virginia.

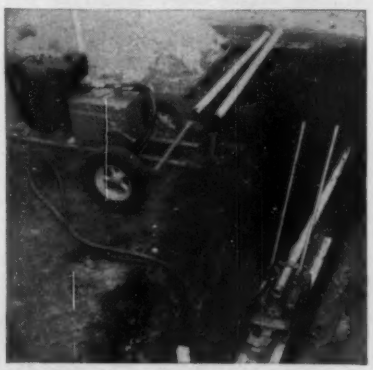
Mountains of paperwork, including specifications and plans for Southern Counties Gas Co.'s projected building in downtown Los Angeles, are examined by SoCounties secretary, Jane Roffler. Contractors are bidding on the $2 million building with construction scheduled to get under way immediately.

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.



Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.
1946 Columbia Avenue • Rockford, Illinois

GAS CALENDAR

June

4- 5. . AGA-PCGA Joint Domestic Gas Research & Utilization Conference—Ambassador Hotel, Los Angeles.

4- 6. . 2nd Annual Corrosion Short Course (NACE & Southwestern Louisiana Institute) — Southwestern Louisiana Institute, Lafayette, La.

5- 6. . NEGA Sales Managers and Supervisors Workshop — Toytown Tavern, Winchendon, Mass.

10-12. . 3rd Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown, W. Va.

11-13. . Gas Measurement School—Worcester Polytechnic Institute, Worcester, Mass.

11-13. . NEGA Operating Division — Sheraton Biltmore, Providence, R. I.

11-14. . National Society of Professional Engineers Annual Meeting — Chase-Park Plaza Hotels, St. Louis, Mo.

14-16. . American Society for Testing Materials—Statler Hotel, Boston.

15-19. . American Society of Mechanical Engineers—Hotel Statler, Detroit.

23-24. . Michigan Gas Association — Grand Hotel, Mackinac Island, Mich.

24-27. . Canadian Gas Association Annual Meeting—Manoir Richelieu Hotel, Murray Bay, Quebec.

August

25-27. . Appalachian Gas Measurement Short Course—University of West Virginia, Morgantown, W. Va.

September

3- 5. . Pacific Coast Gas Association Annual Convention—Multnomah and Benson Hotels, Portland, Oregon.

5. . New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

15-16. . INGAA Annual Membership—The Roosevelt Hotel, New Orleans.

17-19. . Southeastern Gas Association Annual Meeting—Sir Walter Hotel, Raleigh, N. C.

22-25. . 7th International Gas Conference—Rome, Italy.

October

13-15. . American Gas Association Annual Convention—Atlantic City, N. J.

Note rugged branch construction on this massive oil header fabricated with a length of pipe and five 30 x 12 and two 30 x 30 weldolets.

BIG PIPE BIG MONEY to be SAVED by using 30 x 30 BONNEY WELDOLETS

Closer manifolding, ease and speed of field fabrication without header distortion, lower purchase and welding costs are just a few of the profit benefits of header fabrication with Bonney Weldolets. Today there is particular need for reducing costs. Bonney Forge can provide this opportunity for cutting costs in your company. Write, phone or wire for details.

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THREDOLETS®
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CARBON STEEL
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ALLOY
for all services

BONNEY FORGE AND TOOL WORKS

DEPT. B, ALLENTOWN, PENNSYLVANIA

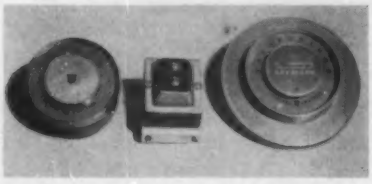
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 85, 86

1. Mobile radio

Motorola has introduced its transistorized mobile 2-way radios. They include 50- and 100-watt units in the 25-54 mc band. Power supply transistors have reduced the size and weight of the 50-watt low frequency unit, enabling mounting in a 10-in. wide housing that can be either dash or trunk-mounted.
Motorola Inc.



2. Heat regulating system

Home warmth and comfort is regulated in advance of outside temperature changes with General Controls' new outdoor "sentinel" system. Called the "thermoramic control," the system consists of a thermal-electric, three-unit package. It contains no moving or wearing parts and can be installed with any new automatic heating system.
General Controls Co.

3. Generating plants

Three new gasoline engine-driven electric generating plants have been announced by D. W. Onan. The high-capacity, ac plants range in size from 100,000 to 150,000 watts. The new units feature Onan-built alternators with new static excitation and magnetic amplifier regulation, coupled to water-cooled Waukeska engines.
D. W. Onan & Sons Inc.

4. Indoor incinerators

Three new indoor incinerators have been introduced by Waste King. Included in the line (at left in photo) is the multiple-chamber smokeless, odorless model specifically designed for use in areas where air pollution is a major problem. The other models are the Deluxe and Custom units.
Waste King Corp.

5. Motorized valve

Edwards Engineering has a new motorized valve for zone heat and other multiple control applications. The valves are suitable for use where a number of circuits—heat zones in a house or other building—are operated from the same reservoir or supply. Each control valve is operated by its own 2-wire low-voltage thermostat or control.
Edwards Engineering Corp.

6. Detector testing

A new kit field tests any portable combustible gas indicator to insure readings obtained are accurate. The kit uses a known percentage mixture of methane and air for checking the reading on the indicator's meter.
Johnson-Williams Inc.

7. Dozer blades

Hydraulically operated dozer blades that can be angled in seconds —while the tractor is in motion— are available on all Case Terra-Tract crawler tractors. Two double-acting hydraulic cylinders mounted on the A-frame behind the moldboard furnish the power for angling the blade 25° to either side.
J. I. Case Co.

8. Flued manways

Only butt welds are needed to join new "uni-formed" ACF flued manway to its storage tank and cover. In single-piece construction,

base of manway is hot-formed from plate that forms a section of the tank itself. Because no welds overlap or are covered, all manway seams can be 100 per cent X-rayed.
Advanced Products Division

9. Baseboard heating

Interchangeable components to suit a variety of installation needs are featured in a new line of nonferrous baseboard heating panels. The new line—called Heatrim—replaces the existing line of American-Standard baseboard panels of the same name. Two attractive enclosures, two high-capacity finned-tube elements and complete matching accessories are offered in the new line.
American Standard

10. Sequence controller

SIE's compressor start unit is the basis of remote reset automatic control for gas pipelines. Named the CSU-1, the unit controls the starting and stopping of any compressor. It sequences all yard, compressor, and auxiliary valving automatically.
Southwestern Ind. Electronics

11. Bottomhole thermal unit

Light weight, top thermal efficiency and application flexibility are features of the Texsteam bottomhole thermal unit. Compact size permits ease in handling. Yet the unitized heater is capable of building surface temperatures to above 450°F.
Texsteam Corp.

12. Wall heater

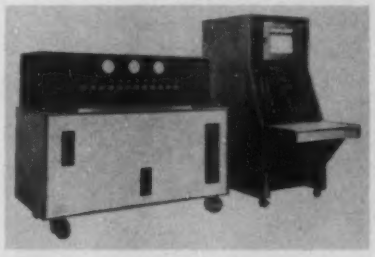
H. C. Little Burner Co. has added an 8000-Btu wall heater to its line. The new heater is vented through the wall to eliminate chimneys. Models are available for recessed installation or for flush mounting on wall. Sealed combustion chamber draws air direct from outside. It is vented through a vent back to the outdoors.
H. C. Little Burner Co.

13. Ductile pipe fittings

Underwriters Lab pressure ratings have been issued Kuhns line of ductile iron pipe fittings, including pipe lock couplings, screwed and flanged fittings, and companion flanges. These fittings are recommended where structural strength and thermal shock resistance are specified and where high pressure sealing is vital.
Kuhns Brothers Co.

14. Non-lubricated compressors

A new line of non-lubricated compressors is designed for heavy-duty service where the air or gas being compressed cannot contact oil or other lubricants. Ingersoll-Rand's new ESH-NL units have special compressor cylinders which use self-lubricating materials in pistons and packing.
Ingersoll-Rand Co.



15. Pressure calibrator

The "recalibration bottle-neck" is reportedly eliminated with a new automatic pressure transducer calibrator. The "Autocal" automatically performs the calibration of one to 12 pressure transducers. In two minutes or less per transducer, the operator has quantitative data on the linearity, hysteresis and drift, and sensitivity factor.
Allegany Instrument Co.

16. Heat gain calculator

Precise, detailed data on heat gain through windows is obtained by using a specially designed slide-chart calculator from Reflectal Corp. The calculator is particularly valuable now that more glass is being used in modern buildings. Lengthy computations and time-consuming reference to printed tables are eliminated with the new calculator.
Reflectal Corp.

17. Easy-to-clean range

Featured in Tappan's new 40-in. range, the Revelation, is a high glass splasher panel with gold fleur-de-lis design. The background is raised to protect walls. Concealed from sight on the panel is a deflected oven vent. The biggest easy-to-clean feature of the new range is the lift-up main top.
Tappan Stove Co.

18. Tire pressure indicator

Designed to save time both on the road and in the shop, and to control truck tire wear, is the No-Lo tire pressure indicator. The miniature pressure gauges screw on the valve stem of each tire. They indicate drops in air pressure automatically when the red tip of a pressure control rod slides back into the valve. When the air is at a safe level, the red rod is visible.
Frebank Co.

19. Extra-thin drop-in unit

Tennessee Stove Works' new Super Thin drop-in griddle top is only 3 in. deep. It requires no front cutout either for controls or for vent. As a result the builder makes only one cutout and the valuable drawer space under the counter top is not destroyed. The 36-in. wide

griddle contains a griddle of 143 sq in. plus two giant and two standard burners.
Tennessee Stove Works

20. Gas refrigerators

The first two models of the 1958 line of Norco gas refrigerators are available. They come in 7- and 4-cu ft sizes. Available in either white or hammered bronze exterior finish, both models feature the new Norcold refrigerating unit. The smaller box is a table-top model.
Norco Inc.

21. Industrial first aid

Davis Emergency Equipment Co. is producing a first aid kit with plastic windows so that the contents of the kit can be seen and checked at a glance without removing units from the kit. Each unit in the C-Thru unit system is wrapped in airtight cellophane with easy-to-open pull tab.
Davis Emergency Equipment Co.

22. Plastic bleeder valve

Walworth has developed a corrosion-resistant, all-plastic bleeder valve. The new valve can be used for bleeding, sampling, or drawing off small amounts of liquid from pipelines, duct systems, tanks and similar applications. According to the company, it has tested successfully at pressures up to 10 times recommended working pressures for PVC systems.
Walworth Co.

23. Expanded heating line

Bryant Manufacturing is offering a wider range of capacities in all heating and cooling lines. Included in the 1958 line are gas furnaces adaptable to air conditioning and a line of competitively priced hot water heaters.
Bryant Manufacturing Co.

24. Operational guides

What ElectroData terms a pair of "mathematical mimics" will help computer users move on to more powerful electronic data processing systems as future workloads demand. Called simulators, the printed operational guides are for use with the Datatron 220 and 205 computing systems.
ElectroData Division

25. Measuring irregularities

A new method of performing the same basic functions as a planimeter has been announced by Charles Bruning Co. The "Areagraph"—a transparent film printed with a pattern of grids and dots—quickly and accurately measures irregularly shaped areas on maps, drawings, charts, photographs, and plane objects.
Charles Bruning Co.

26. Steel buildings

A new line of all-steel utility buildings is announced by Stran-Steel Corp. The buildings are available as do-it-yourself jobs or can be erected by dealers. The Stran-Master comes in a wide range of sizes, from widths of 12 ft to 120 ft and in length to any multiple of 16 ft. Windows and doors can be placed anywhere.
Stran-Steel Corp.

27. High-strength pipe

High-strength grades of pipe in small size ranges is in production at Tex-Tube's plant. The company is producing sizes and grades of pipe particularly suited to the gas industry. The grades are API 5L X-42, X-56 in 6⅝-in. OD pipe below 12.89 lb/ft. And, in smaller diameters — 4½-in. OD down through 2⅜-in.
Tex-Tubes Inc.

28. Flow rate indicator

Remote indication of flow rate, speed, or position is provided by the new Metertrol from Jordan Co. When used with the Jordan Shaftrol shaft-mounted gearmotor, it provides remote or automatic control for valves, variable speed drives, and a variety of other machinery. The Metertrol may also be used with any other positioning device which incorporates or drives a potentiometer.
Jordan Co. Inc.

29. Transmitter-receiver

General Electric has entered the hand-carried two-way radio field with a portable transmitter-receiver. The new product is completely transistorized. First units off the production lines are engineered for frequencies up to 100 mc and will be used in G-E's 25-54 mc low-band portables. Sensitivity of the new equipment will be extremely important in remotely located areas where communications reception normally is poor.
General Electric Co.

30. Gas alarm

The M-S-A Explosilarm is a small, completely self-contained combustible gas alarm. It is intended for installation in non-hazardous areas. A sample line as long as 100 ft may be used. It is particularly suitable for use around scattered natural gas operations and compressor stations.
Mine Safety Appliances Co.

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

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GAS DIGEST

TRADE LITERATURE

31. Centrifugal compressors

Detailed engineering data and performance characteristics of centrifugal compressors are contained in a 64-page illustrated catalog from Clark Bros. Co. In addition to a guide to writing specifications, the catalog has a general section dealing with compressor fundamentals.
Clark Bros. Co.

32. Holiday detector

Portable holiday detectors for quick, easy inspection of tape coating are the subject of a date sheet from Tinker & Rasor. Discussed is the LS-1, which is designed primarily for the electrical inspection of pipe or metal surfaces wrapped with protective tapes.
Tinker & Rasor

33. Plastic pipe

Actual installation photos illustrate a new catalog from Kraloy Plastic Pipe Co. Plastic pipe installations in Arizona, Nevada, and California are discussed.
Kraloy Plastic Pipe Co.

34. Thermometers

Catalog C60-2 describes the complete line of Brown rectangular case, filled system thermometers. Indicators, recorders, transmitters, and electric or pneumatic control instruments are covered in the 56-page catalog.
Minneapolis-Honeywell

35. Tractor versatility

International Harvester has published catalog CR-1067-H on International 330 and 350 utility tractors. Dozens of ways to mechanize jobs often done by hand or by smaller tractors and equipment are suggested.
International Harvester Co.

36. Plastic book

A 36-page book explains how Tenite polyethylene resins can be used to make a wide variety of functional plastic products. Eastman Chemical devotes separate sections of the book to each of the six basic uses for polyethylene.
Eastman Chemical Products

"For tight spots and tough roots... nothing beats our Buckeye 403's!"

— says J. W. Cain, Sarnia, Ontario

Seventy-eight miles of service line and connections will soon bring natural gas to hundreds of thousands of Ontario residents. Handling the ditching is Contractor J. W. "Jim" Cain, a newcomer to Canada's booming pipeline industry.

"Our biggest obstacle is the hundreds of hardwood trees that line every residential street," says Mr. Cain. "That's why we've standardized on the Buckeye 403. It's the only machine I know that can maneuver quickly . . . yet has plenty of power to knife through thick roots. We own five Buckeye 403's. They've practically eliminated time-consuming stops where a hatchet or a shovel previously had to be used."

See for yourself! Your Gar Wood-Buckeye dealer demonstrates the 403 Utility Ditcher. Call him soon or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

Gar Wood Excavators

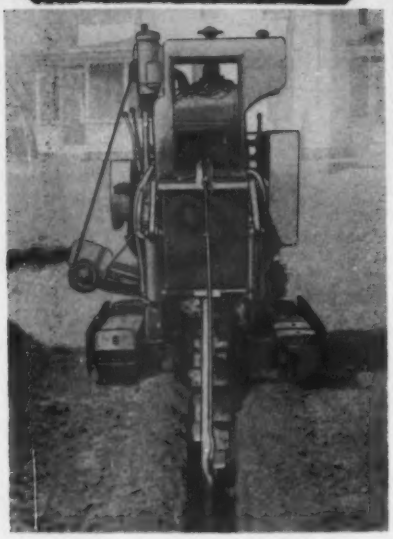
Gar Wood Winches

Gar Wood–St. Paul Hoists & Bodies

Gar Wood INDUSTRIES, INC.

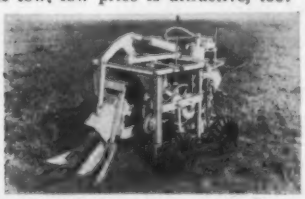
Findlay, Ohio • Wayne, Michigan

FOR FAST, LOW COST DIGGING USE A Pow-R-Ditcher



Model 4T Pow-R-Ditcher

There's no worry about those "tight spots" with a rugged 4T Pow-R-Ditcher. Extremely maneuverable and only 48" wide, the 4T really does a fast digging job . . . and at the lowest possible cost, too. Digs 6" to 14" wide and can be transported in a pickup truck. Here's a one man self-propelled unit that is ideal for the light construction field . . . and the low, low price is attractive, too!



Model W-2 Pow-R-Ditcher

The smallest of the Pow-R-Ditcher line . . . the W-2 is built to take it, with heavier chain, heavier hydraulic boom and heavier frame. Only 10' long, 51" high and 48" wide, an excellent unit for digging 2½" to 4" wide gas service, electrical service or shallow water lines. Has self-propelled 4-wheel drive. A real workhorse!

Write for Literature and Low Prices on the Complete Vermeer Pow-R-Ditcher Line

Larger Pow-R-Ditcher model also available. See the Pow-R-Ditcher in action . . . and CHECK THE QUALITY AND PRICE before you buy. Write or visit your Vermeer dealer.

VERMEER MANUFACTURING CO.

1441 W. WASHINGTON • PELLA, IOWA

GAS • PEOPLE

Burt Larson
SoCounties

Albert Klemmer
Rochester Gas

BURT LARSON, manager of residential sales since 1951, has been promoted to general sales manager of Southern Counties Gas Co., Los Angeles. Mr. Larson will retain the residential sales duties as part of his new post. He joined SoCounties in 1939.

ALBERT J. KLEMMER has been elected auditor for Rochester (N. Y.) Gas & Electric Corp. Since joining the company in 1946, Mr. Klemmer has served as supervisor of systems and methods, manager of accounting developments in the administrative department, and acting auditor.

LOUIS E. SCHMIDT has been named general auditor of Equitable Gas Co., Pittsburgh. Mr. Schmidt, who joined the company in 1933, has held a number of supervisory posts, the most recent being that of division accounting manager.

Three men have been promoted in the development department of Union Carbide Chemicals Co. at South Charleston, W. Va. A. C. HAMSTEAD and H. M. RIFE have been appointed staff associates and L. S. VAN DELINDER is group leader.

L. L. GOWANS, vice president of engineering for Honolulu Gas Co., has been elected a member of the board of directors. Mr. Gowans

Louis Schmidt
Equitable

L. L. Gowans
Honolulu

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY
Incorporated
3164 S. CALIFORNIA AVE.
CHICAGO 8, ILLINOIS
Elizabeth, New Jersey

joined the company's industrial sales division in 1921. Later he became superintendent of the company's distribution department and and during World War II served as head of the company's manufacturing plant.

W. F. IVERS has retired as Beaumont (Texas) division manager for United Gas Corp. Mr. Ivers has completed 28 years of continuous service with United. ROSS WALKER, assistant division manager at Beaumont since January, succeeds Mr. Ivers. Before transferring to Texas, Mr. Walker, with United Gas for more than 20 years, served as district manager in Gulfport, Miss.

WALTER E. BIMM has been appointed to the field staff of Geo. D. Roper Corp., Kankakee, Ill. He will cover the state of Illinois outside of greater Chicago. Mr. Bimm has been assistant sales manager of Roper since 1949.

W. F. MUNNIKHUYSEN, chairman of the board of Koppers Co. Inc. since 1955, has retired from that post. The board elected FRED C. FOY to the dual post of president and chairman. Mr. Munnikhuysen, with Koppers since 1916, served the company in many executive capacities. In 1950 he was named executive vice president and elected to the board. In 1955 he became chairman. Also in that year Mr. Foy was elected president and chief executive officer of Koppers. Mr. Munnikhuysen will remain as a board member and serve in a consulting capacity.

J. I. Case Co., Racine, Wis., has organized a utility sales department. Heading up the new operation is WILLIAM J. SCHLAPMAN. Assistant sales manager of the utility line is W. H. VOGEL. Both men formerly were with Wagner Iron Works. Case also has named ROBERT F. KEHRER as industrial parts manager and FRANK J. PALERMO director of manufacturing, a newly created post.

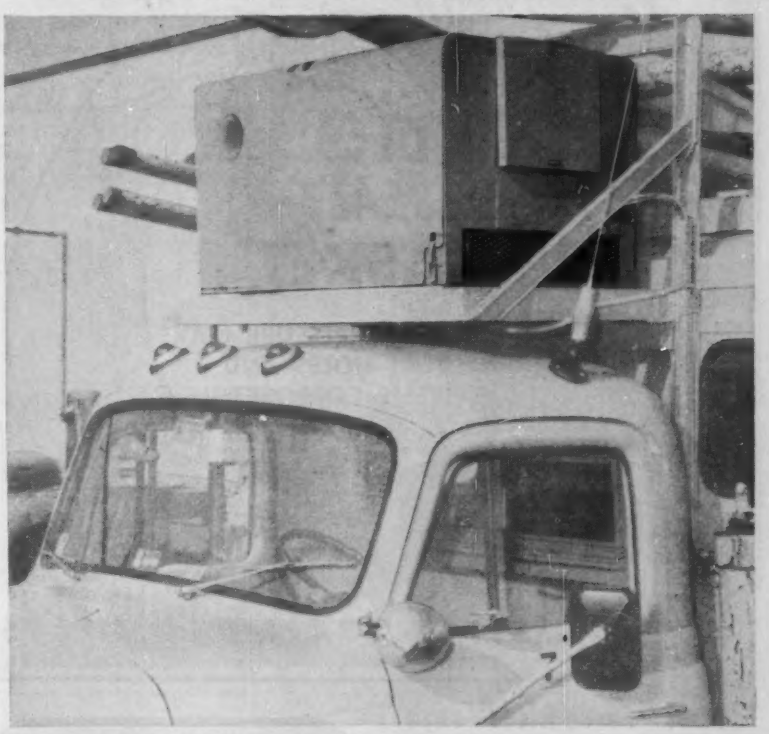
W. F. Ivers
United

Ross Walker
United

Onan ELECTRIC PLANTS

ELECTRIC PLANT NEWS

Onan ELECTRIC PLANTS



For keeping radio batteries charged . . .

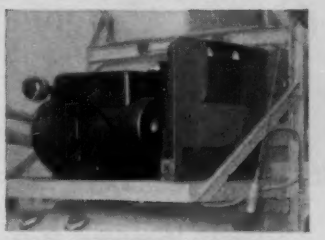
Truck-mounted Onan Electric Plant saves 6-10 gallons of gas per day!

Operates Onan Rectifier Battery Charger installed in truck body; delivers 2,000 watts A.C. for tools and lights

This 2KW Onan Plant, driven by a single-cylinder, air-cooled engine of 5 H.P. makes it unnecessary to run the 150 H.P. truck engine for battery charging. It saves gasoline and cuts down on truck engine maintenance. Savings of from $2.00 per day to $800.00 per year per truck have been reported. Moreover, the electric plant supplies 2 KW of *plug-in power* for electric saws, drills and lights used in construction and maintenance.

The installation above has the plant mounted over the truck cab. Other companies have installed units within the truck body. Onan air-cooled plants equipped with the optional, low-cost Vacu-Flo system *can be completely enclosed.*

There's an Onan Packaged Power system that can cut your costs substantially. Describe your need and let us help you.



ONAN MODEL 2LK-IRV shown with weatherproof steel housing removed. Mounting frame is attached to truck body. Plant is accessible for servicing. Entire unit can be transferred easily to new trucks. This plant is started electrically.

Special folder F-111 describes 3 Onan battery charging systems. Write or call.

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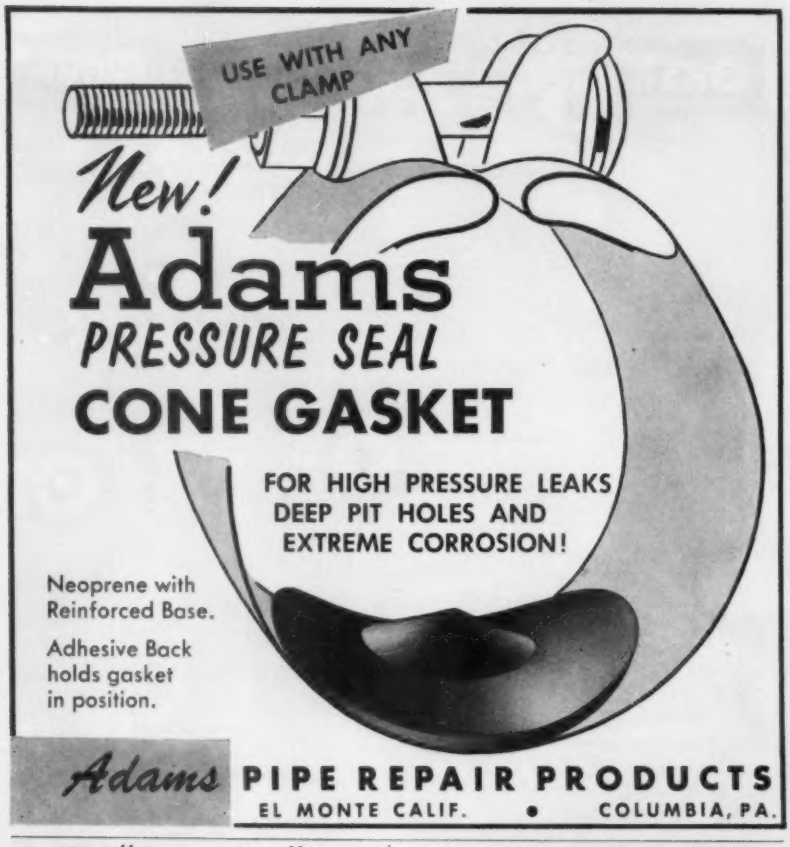

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people • *Continued*

Fred Wemmerus
Ludlow

Richard Cummings
Ludlow

FRED W. WEMMERUS has joined Ludlow Valve Manufacturing Co., Troy, N. Y., as chief engineer. Mr. Wemmerus has spent 22 years in design and supervisory engineering for heavy industry. He succeeds RICHARD A. CUMMINGS, newly elected Ludlow vice president in charge of manufacturing. Mr. Cummings has been with Ludlow since 1947.

JOE C. HARDIN has begun a full-time public relations assignment with Arkansas Louisiana Gas Co. LYNDSEY HATCHETT, an ALG vice president, will be in charge of all gas company operations in the state of Arkansas. Mr. Hardin, a member of the ALG board since 1955 and a vice president since 1956, formerly was in charge of operations in the Arkansas division.

NORMAN V. GRUND, assistant to the president of Cleveland (Ohio) Trencher Co., has retired after 17 years of service with the company.

WILLIAM W. BABCOCK, vice president of Central Illinois Light Co., Peoria, has been elected a director of the company. He succeeds JAMES A. BROWN as consultant. Mr. Brown was named director emeritus after 28 years of service on the board.

New York State Natural Gas Corp., Pittsburgh, has made several new appointments. FRANCIS COLE is now head engineer of the Woodhull compressor station in the northern division. JOHN F. NELSON has been named superintendent of the newly created Leidy district. ALBERT H. RESCHKE and JOSEPH CODDINGTON have been appointed assistant managers engineering. Both men have been assistant chief engineers since 1957.

Several changes have been announced by Dresser Manufacturing Division, Bradford, Pa. DONALD L. GARRISON transfers to Chicago as

Donald Garrison
Dresser

James Mattern
Dresser

district manager-gas; JAMES L. MATTERN goes to Atlanta as southeastern district manager-gas; and RICHARD T. ALT is north central district manager-gas with headquarters in Minneapolis.

DAVIS WATKINS has been appointed manager of Mountain Fuel Supply Co.'s distribution department. Other promotions and reassignments include: D. J. ROBISON to superintendent of distribution; CLAIR F. COLEMAN succeeds him as assistant superintendent of distribution; HAROLD R. HEATH JR., who has had charge of the company's gas laboratory and technology, succeeds Mr. Coleman as design engineer. In a reassignment of duties in the distribution division, additional responsibilities were given to CLIFFORD M. REYNOLDS, supervisor of utilization, and his assistant, CLINTON B. RAPP.

DONALD E. BARR has been appointed manager of the Springfield division of Ohio Fuel Gas Co. He replaces D. S. MCINTIRE, who has retired.

MARC B. ROJTMAN, formerly executive vice president, is the newly elected president of J. I. Case Co., Racine, Wis. JOHN T. BROWN, formerly president and chairman, was re-elected chairman of the board. Mr. Rojtman, a young executive of 40, formerly served as president of American Tractor. He joined Case through the merger of the two companies in 1957. Case also has named ERNEST N. CHAMBERLAIN as controller. He succeeds JOHN D. GRAYSON, who recently was elected president of the J. I. Case Credit Corp.

JAMES G. VLAHOS is assistant sales manager in the LPG division of Anchor Petroleum Co., Tulsa.

SHIRLEY MCGILLICUDDY has been appointed assistant home service supervisor of Southern Counties Gas Co., Los Angeles. Mrs. McGillicuddy will serve as acting home service supervisor in the absence of Katherine L. Rathbone, who is on disability leave.

C. HOMER WORKMAN has been named vice president of United Fuel Gas Co. and affiliated companies. He succeeds ROBERT J. RYDER, who has retired. Mr. Workman formerly was assistant vice president in the office of rate and depreciation.

DAVID T. GILBERT has been elected president of Greenwich (Conn.) Gas Co., succeeding GARDNER L. BRISTOL, who has retired. Mr.

Richard Alt
Dresser

Marc Rojtman
J. I. Case

Operation of these four-66" I.D. Scrubospheres has demonstrated their superiority over oil bath dust scrubbers. The dust removal ability of the SCRUBOSPHERE is outstanding because it utilizes wetted surfaces for dust collection which are more closely spaced than in conventional equipment.

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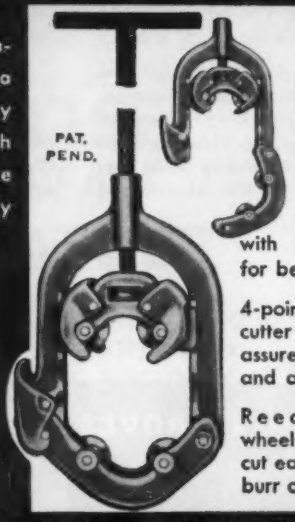

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people • *Continued*

Bristol has been with the company for the past 32 years. Mr. Gilbert served as vice president, treasurer, and secretary prior to his election to the presidency. Greenwich Gas also elected RICHARD A. WINSLOW as treasurer.

W. C. PIERSON has been named general superintendent of gas operations for Philadelphia (Pa.) Electric Co. Mr. Pierson, with the company since 1924, most recently served as general superintendent in charge of gas transmission and distribution. J. W. CARROLL succeeds Mr. Pierson in his former position.

SHERMER L. SIBLEY has become vice president and general manager of Pacific Gas & Electric Co., San Francisco. He has been PG&E's vice president and assistant general manager since 1955. The company also named J. DEAN WORTHINGTON chief civil engineer, succeeding CARL W. APPLEFORD, who has retired after 38 years of service.

NORMAN E. KENYON is administrative assistant to the president of Michigan Consolidated Gas Co., Detroit. Mr. Kenyon is a former Detroit newspaper man and most recently was public relations director of the Fred M. Randall Agency.

Q. T. WILES, 38-year-old president of Good-All Electric Manufacturing Co., Ogallala, Neb., has been elected a member of the Young Presidents' Organization. Membership in the group is limited to men who have headed their organization before the age of 40. Their companies must have gross annual revenue of at least $1 million and a minimum of 50 employees.

SAMUEL A. CHADWELL, chief dispatcher for Columbia Gas System's gas transmission headquarters in Charleston, W. Va., retired last month. Mr. Chadwell, 65, is a veteran of nearly 46 years with Columbia and its Ohio Fuel Gas Co. subsidiary.

HOWARD SNYDER has been named Minneapolis-Honeywell Regulator Co.'s sales manager for residential gas heating controls. He succeeds J. P. MCCARDLE, who recently became manager of Honeywell's operations in continental Europe. J. W. PARK succeeds Mr. Snyder as

Milwaukee sales manager. HANK KURTZ, with Honeywell since 1953, succeeds Mr. Park as manager of residential control sales in the Chicago branch office.

G. A. HOFFMAN has been appointed assistant vice president, metropolitan division of Walworth Co., New York. Mr. Hoffman is manager of the Metropolitan sales division, which includes an area of 50-mile radius of New York City, with headquarters in Harrison, N. J. The company also elected THERON D. HYATT, treasurer. Mr Hyatt, who joined Walworth in 1941 as general credit manager, has been assistant treasurer since 1955.

JACK B. LIVINGSTON has been promoted to planning engineer for Peoples Natural Gas Co., Pittsburgh. Under the direction of Chief Engineer Howard Joiner, Mr. Livingston organized the planning department in 1953.

C. E. PARSON, former advertising manager for Chambers Built-Ins Inc., Chicago, has rejoined the firm as director of advertising and sales promotion. Mr. Parson, who was with Chambers for six years, recently has been in charge of ad-

To Sell Them on Gas
...Sell them
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Exclusive Performance
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Norm Millard
Manager Utilities, Philco Corporation G-2
Tioga and C Streets, Philadelphia 34, Pa.

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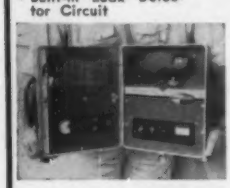

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people • *Continued*

Robert Crane
Dresser

C. E. Parsen
Chambers

vertising for Avco's American Kitchens. Chambers also announces the appointment of ARTHUR F. GUYTON as southeastern division manager with headquarters in Atlanta. He will cover Georgia, North and South Carolina, Florida, and central Alabama. HUBERT JUNGE is now Michigan district manager, with headquarters in Oak Park, a Detroit suburb.

ROBERT D. CRANE is assistant director of purchases for Dresser Industries Inc., Dallas. He moves to Dallas from his post as manager of purchases for Dresser Manufacturing Division, one of the Dresser Industries.

Deaths

FRANCIS B. FLAHIVE, retired vice president of Columbia Gas System Service Corp., died recently in Danbury, Conn. He was 68. He joined Columbia Gas in 1927. In 1941 Mr. Flahive was named vice president in charge of insurance, pensions and motor vehicle operations, the post he held at the time of his retirement in 1954.

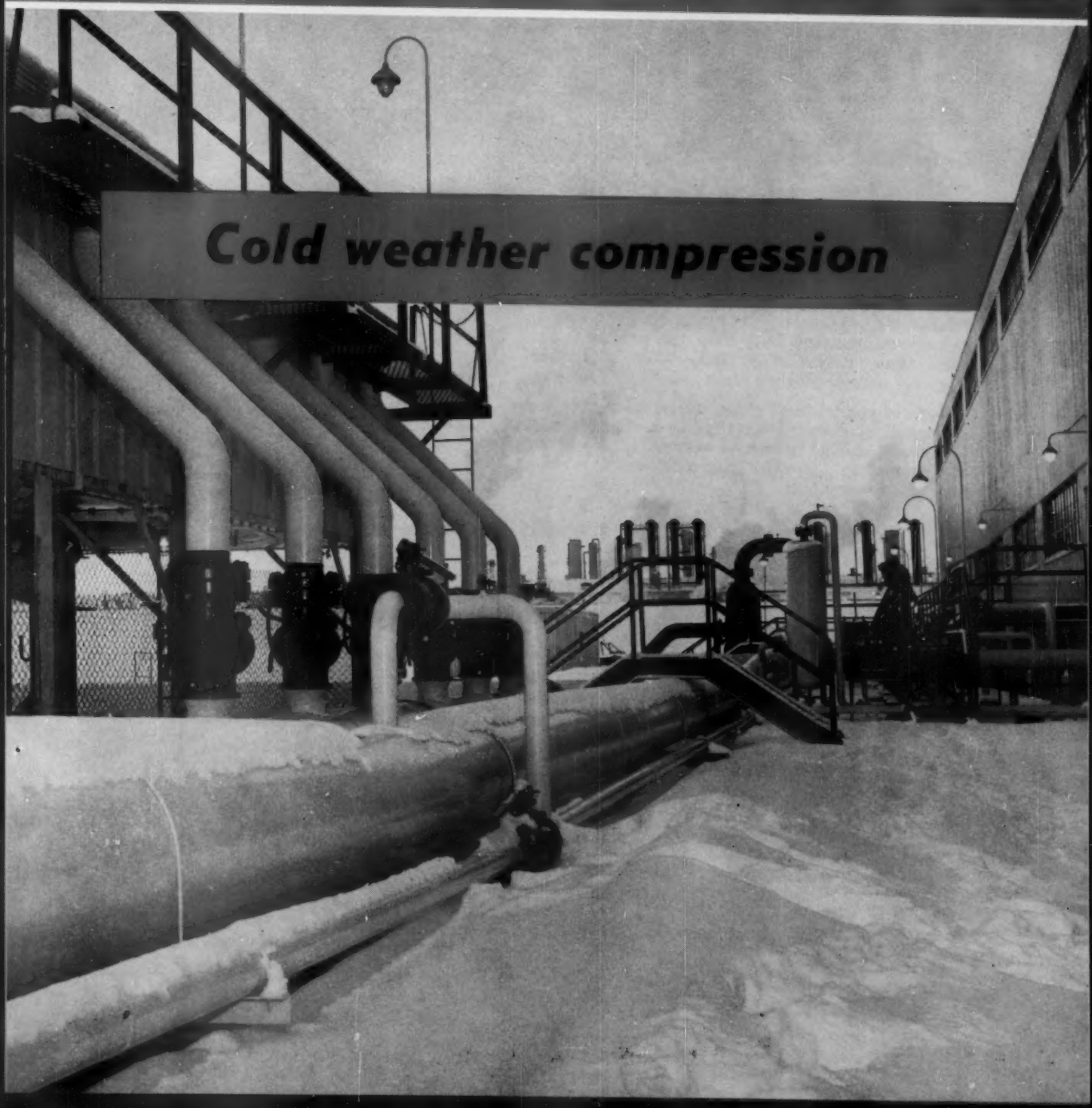
ROY R. RIORDAN, 50, salesman for Plastic Engineering & Sales Corp., Fort Worth, Texas, died recently. Mr. Riordan was associated with PESCOR for the past two years, covering Arkansas, Louisiana, and Mississippi.

FRED CHAMPION, former treasurer and assistant secretary of Southern Counties Gas Co., died late in April. He was 83 years old. Mr. Champion, who retired in 1940, joined the gas company in 1913 as district agent in Santa Ana.

THOMAS C. BUCHANAN, former chairman of the Federal Power Commission, died recently at his home in Beaver, Pa. He was appointed to the FPC in 1949 and served until 1953.

GAS

PIPELINE SECTION



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L·O·F GLASS FIBERS COMPANY
TOLEDO 1, OHIO

Louder than words, these straight-up plumes at Taylor, B. C. say that it is cold outside . . . and it is.

Westcoast winterizes stations to operate in –35° weather

By JAMES JOSEPH

FORT ST. JOHN, BRITISH COLUMBIA . . . six white plumes—exhausts from six compressors—finger into the sub-Arctic chill. Better than thermometers, those vertical, almost stagnant plumes say that it's cold outside. And it is—the mercury hovering at —35°.

But Westcoast Transmission Co. Ltd.'s Compressor Station No. 1, rising close by the Alaska highway, is winterized to take it. So are its three sister stations along the 650-mile, 30-in. pipeline which taps British Columbia and Alberta gas fields.

In all, 17 heavy-duty compressors—a total 52,500 installed horsepower—route gas from far northern fields, deliver it to Huntingdon, B. C., near the U. S. border. At Huntingdon, Westcoast's $195 million line—operative only since October 1957—meters to two distribution companies, among them Pacific Northwest Pipeline Corp. (which serves some half dozen states, including Washington, Oregon and Colorado). Of Westcoast's initial 300 MMcf daily gas capacity, Pacific Northwest is taking 225 MMcf. British Columbia Electric Co. Ltd. receives some 30

PART ONE OF A THREE-PART SERIES

GAS exclusive

Location of Westcoast's compressor stations is shown on this map of the pipeline.

MMcf/day. Another 5 MMcf/day goes to Inland Natural Gas Co. Ltd., which distributes in eastern British Columbia.

Through its Pacific Northwest Pipeline link, Westcoast's gas—tapped more than 750 road miles north of the American border—hooks into El Paso Natural Gas's system, thus may eventually reach California consumers.

Spaced at approximate 160-mile intervals along the mainline—the Dominion's first major gas pipeline—stand four compressor stations:

Compressor Station No. 1, the initiating station, rises athwart the Alaska highway at Taylor, B. C., heart of Westcoast's new, $30 million industrial complex. Here British Columbia "sour" gas is "sweetened" (extracted of its by-products), compressed and sent toward the U. S. border. Station No. 1 houses six 2000-hp Ingersoll-Rand 412 KVS heavy-duty, direct-connected, turbocharged, 4-cycle, gas-engine driven gas compressors.

Compressor Station No. 3, at Lake McLeod, some 90 miles north of Prince George, B. C. (and 150 pipeline miles downstream from Station No. 1) has as its core four 3500-hp Nordberg high-pressure, supercharged, V-type FSE-1316-HSC, four-cycle gas engines driving De Laval BLV-24 x 24 single-stage centrifugal compressors. Engines drive through single-step speed-increasing gear with a 10:1 ratio.

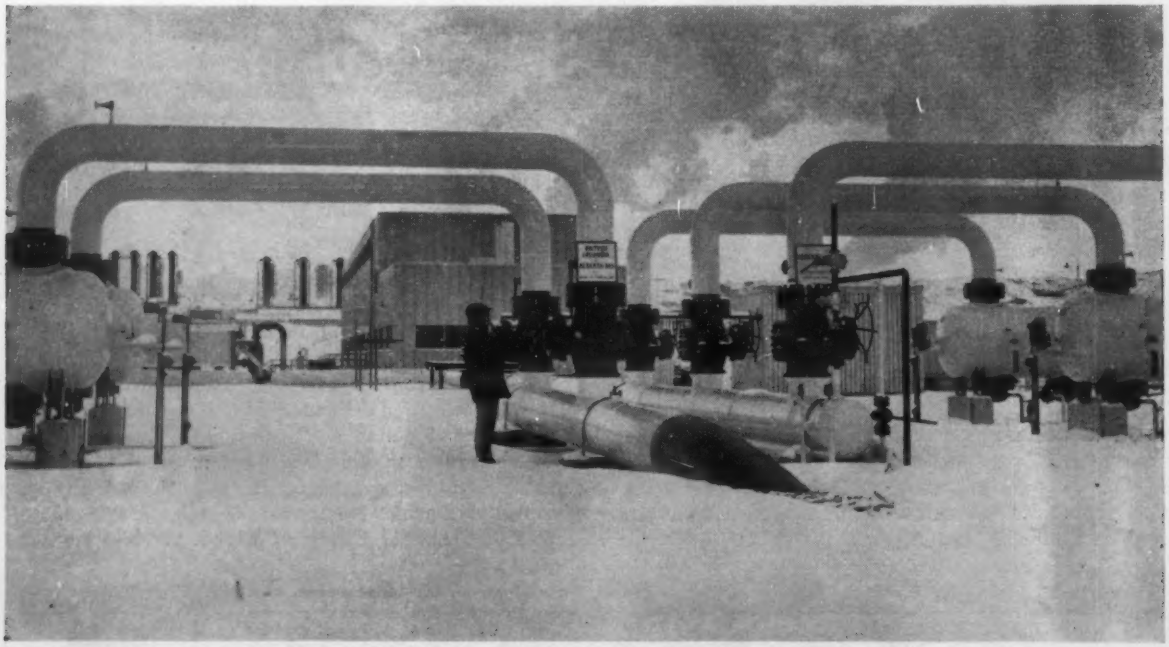
Compressor Station No. 5—319 miles by pipeline downstream from the initiating station — likewise operates four 3500-hp Nordberg supercharged FSE-1316-HSC gas engines driving De Laval BLV-24 x 24 single-stage centrifugal compressors.

Compressor Station No. 7, 27 miles west of Kamloops, B. C., and closeby the Savona river, lies 484 pipeline miles below Station No. 1. Here work three 3500-hp Nordberg FSE-1316-HSC gas engines driving De Laval BLV-24 x 24 centrifugal compressors. As in Station 3, piping is looped between each compressor.

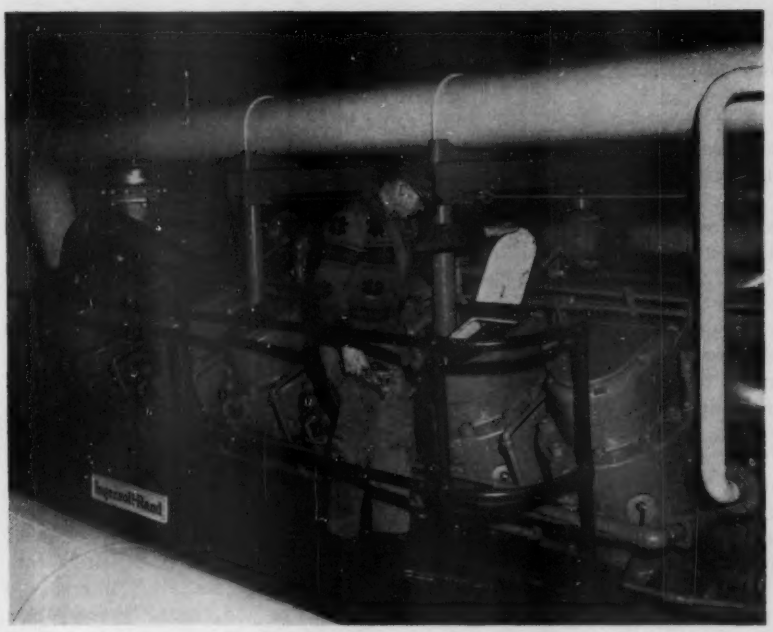
As initiating station—and most northernly complex of its kind in all North America—Station No. 1 deserves special scrutiny.

Essentially, two 26-in. suction headers pipe natural gas to the station's six compressors: (1) a 24-in. suction header carrying wet "sour" gas (a corrosive mixture of natural gas, H_2S, CO_2 and distillates) from British Columbia fields; (2) a 24-in. suction header gathering from Alberta's "sweet" gas fields.

Sour gas: sour gas, at about 36° F, 410 psig, routes



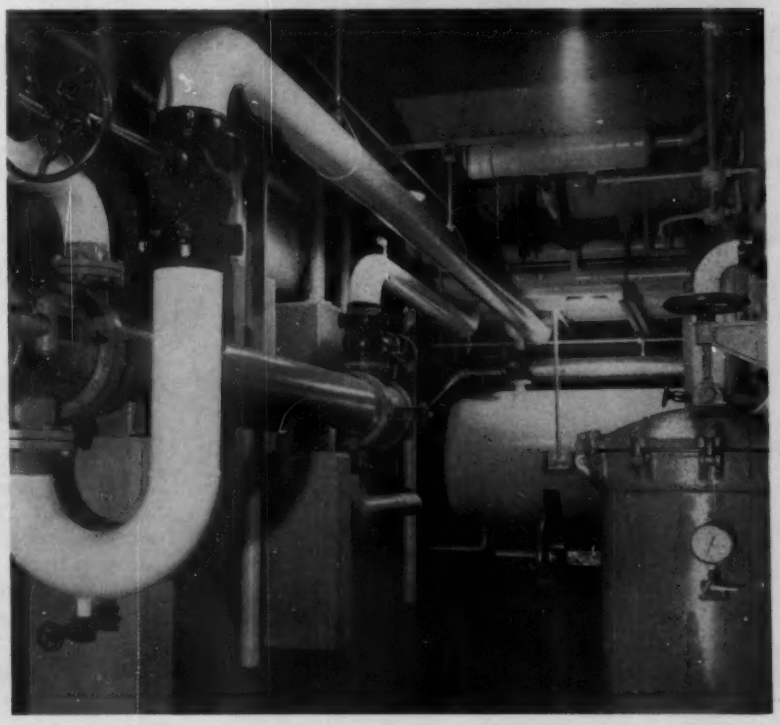
Westcoast's Station No. 1, initiating station on the 650-mile line.



Westcoast Station No. 1 superintendent Melvin Shannon inspects one of the six engines.

from British Columbia fields, processes through two King Tool inlet scrubbers (where condensates are removed), flows to a 5-ft dia., 9-in. long knockout drum (which flares hydrocarbons), thence to one end of the compressor station's 24-in. suction header. Fed by this header (via 12-in. laterals) are the 30-in. suction bottles on three of the station's six compressors (Compressors Nos. 4, 5 and 6). Compressed to about 840 psig, its temperature raised to some 117°, sour gas leaves the compressors' 30-in. discharge bottles via a 10-in. lateral, then by a 24-in. discharge header is fed to nearby process plants (where sour gas is made to yield up elemental sulfur; and where butane, propane, motor and diesel fuels are processed from pipeline distillates). "Sweetened," the gas passes to two Griscolm-Russell forced convection tube-type aftercoolers thence through King Tool outlet scrubbers before entering Westcoast's 650-mile transmission system.

Sweet gas: Alberta sweet gas, requiring no processing, enters the station compound at 475 psig, 28° F —via a 26-in. suction header. Scrubbed through



Basement installation of engine and compressor equipment at Station No. 1 gets winter-vulnerable equipment out of the cold. Seen here: jacket water coolers, lube oil filters.

three King Tool liquid separators (with total 200 MMcf/day operating capacity), sweet gas flows by 16-in. scrubber laterals to the station's 24-in. main suction header, thence by 12-in. laterals to suction bottles of three compressors (Nos. 1, 2 and 3). Compressor No. 4, though currently compressing sour gas, is a "swing engine"—piped to handle either sour or sweet on demand.

Discharging compressed to 810 psig, sweet gas routes via 10-in. laterals to the station's 24-in. discharge header, thence to the two King Tool aftercoolers. Entering the aftercoolers at about 167° F, gas is dropped to 100° before flowing through outlet scrubbers (same size as suction scrubbers). Here, the 24-in. pipe becomes a 26-incher, spans the Peace river via a 1675-ft pipeline suspension bridge (longest of five along the system), finally hooks into the 30-in. mainline.

Compressor station: taking no chances, engineers "winterized" the plant, both inside and out:

(1) All hot-water pipes, though run inside the building, are jacketed in aluminum, the jackets packed with rockwool.

(2) Fuel-gas powering compressors is pre-warmed. Tapped from the 24-in. suction header, fuel gas passes to a Griscolm-Russell heater (which, thermostatically controlled, warms gas to 100° F). From the heater, gas routes to a 5-ft long, 18-in. dia. vertical surge tank. Out of the surge unit, gas (2000 cfm, 100 psig) flows to the engine fuel header. The 180° hot water (warming the fuel gas heater) comes from two dual-fueled (natural gas and propane) package boilers (each 2.5 million Btu/hr) supplying the station's 39 coil-fan heaters and jacketed piping.

Bank of engines and their control panels. Note how exhaust jackets are rigged with fans, sucking some hot air into building, thus relieving heating system.

(3) Four-bladed fans, housed in jackets insulating each engine's Maxim exhaust silencer, pull exhaust-heated fresh air into the building—taking some of the load off the heating system.

(4) All liquid-carrying exterior piping is either (1) buried 6 to 9 ft underground (thus below the 3-ft frost level) or (b) steam-jacketed.

(5) Because water towers would freeze and burst —where temperatures plummet to —50° domestic and engine make-up water is likewise stored underground, the tanks buried beneath the station's heated garage. Make-up water comes from Westcoast's nearby steam plant.

(6) Engine cooling systems are protected by a 50 per cent water-50 per cent glycol anti-freeze mix.

(7) Provision is even made for pre-warming engine air—through each engine's jacketed exhaust silencer. And, of course, only Arctictype oil is carried in the American oil-bath intake air filters.

(8) Even lube oil storage and reconditioning units are housed out of the cold—in the station's basement. Among major tankage: a 2500-gal. lube-oil transfer tank, 2000-gal. clean-oil transfer vessel and 1200-gal. used oil settling tank.

Engine room: Essentially, the engine room is two-storied: the big Ingersoll-Rand gas-engine driven compressors line the main floor. Engines have a bore of 15¼ in., a stroke of 18 in. Directly beneath them, in the basement, is located most auxiliary equipment.

So corrosive is sour gas that compressors handling it are equipped with special stainless steel rods. Regardless, all cylinders have a 15-in. stroke, a maximum working pressure of 1000 psig.

Engines are installed with Elliott turbochargers (which force air into intake manifolds at 4 psig).

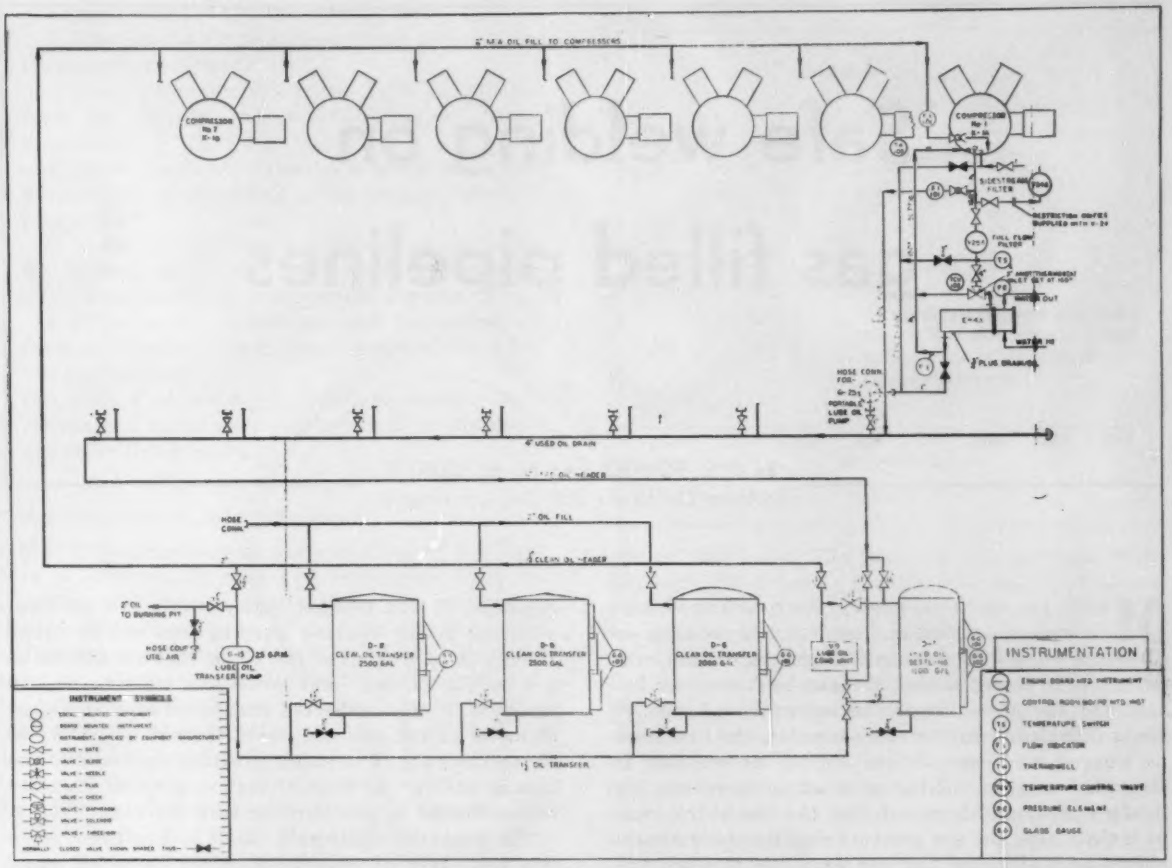
Each engine's unit control board monitors: (1) jacket water temperature; (2) manifold gas pressure; (3) manifold air pressure; (4) air filter motor; (5) lube oil temperature and pressure; (6) fuel gas pressure. An Alnor pyrometer gauges exhaust temperatures from each engine's 12 cylinders and turbocharger.

As an ironic reminder that this is the sub-Arctic, each board is also rigged with remote indicators and actuators—designed to open-close suction, discharge and bypass valves (without the operator donning a parka and braving the cold). The remote setup, however, has been thwarted by freezing temperatures, this though it's pressurized by 250 psi of air. Valves, outside the plant, freeze solid—must be manually operated.

"The sub-Arctic," says plant super Melvin Shannon dismally, "fouled the best laid plans. Those remotes? They just don't work."

Alarm lights, on two unit engine boards, warn of too high a liquid (distillate) level in the process scrubbers—which feed sour gas to three of the engines.

"If that light goes out," winces an operator, "we're in trouble."



Lubricating oil flow sheet for Station 1.

Backing up the board are sniffers—corrosive gas detectors—worn at all times by at least one operator on duty. For H_2S can kill—and with the first lungfull.

Directly beneath engines—in the basement—are located (1) jacket water coolers, which drop 35° from the 180° entering water; (2) lube oil coolers —which drop oil from an entering 160° to a leaving 145°; (3) lube oil filters, both full flow and sidestream; (4) and each engine's four 30-in. discharge bottles.

Winterization decreed an all-under-one-roof design —the station's auxiliary area isolated from the engine room by a firewall.

Auxiliary Area: Two starting air-compressors (both Ingersoll-Rand 2-stage, belt-driven, 100 cfm at 250 psig) provide engine start-up. The main compressor is driven by a 30-hp GE motor. The standby is powered by natural-gas fueled Waukesha engine, model GUK, driving through a Twin Disc clutch.

Both compressors feed two starting-air receivers (3 ft dia. x 18 in., 300 psig).

Source of both utility and instrument air is a motor-driven (30-hp GE) Ingersoll-Rand compressor (2-stage, V-belt driven, 100 cfm, 100 psig) which feeds a utility air receiver (125 psig working pressure). Air from this vessel routes through a Lecto-dryer (dehumidifier) and, reduced to 60 psi, is held in an instrument air receiver.

Roof run-off. Among the station's more interesting "winterization" features are its roof drains. Arranged along the low-side of the compressor building's built-up roof (the slope: 1 ft in 42 ft) are eight drains, spaced on 12-ft centers, and installed *inside* the building, just under the roof.

Installed inside, too, are the drains' 4-in. dia. cast iron vertical runs which drop from the roof, continue through the basement and don't tie into 12-in. storm sewer lines until they're well below possible frost level.

Edging the station's roof—and downslope from its eight drains—rises a 3-ft high, 10-in. thick concrete parapet. Its purpose: to act as a kind of snow fence, collecting drifting snow which, warmed by the roof, melts and flows to the drains.

As for those six white plumes—exhausts from the Ingersoll-Rand compressor engines — which finger stagnantly into the sub-Arctic chill? Louder than words—or even thermometers—they say that it's cold outside. And here, along the Alaska highway, it is. ■

(The author will detail the design and operation of Westcoast's three downstream stations in the July issue of GAS.)

Safe welding on gas filled pipelines

By J. S. POWELL and H. M. CURTIS
Southern California Gas Co., Los Angeles

MANY gas utilities employ the practice of oxy-acetylene cutting and electric arc welding on pipelines filled with combustible gas. To do this with safety, it is essential that the gas be free of air because of the possibility of an internal explosion. If air is introduced during any operation, the line must be purged with gas before cutting or welding is started. During a cutting or welding operation, air is often prevented from entering the line at the joint by maintaining the gas pressure slightly above atmospheric and allowing the gas escaping through the joint to burn on the outside. This procedure is referred to as "controlled fire welding." Another method that is used to provide safe working conditions during cutting or welding operations is to replace the gas in the pipe with a non-combustible.

Using the controlled fire welding procedure on a 60-in. compressor suction line at the Southern California Gas Co., several men were very severely burned when a mixture of air and gas within the line exploded. It was thought that possibly this accident occurred either because purging was not thorough enough to remove all of the air or that air entered at the bottom of the joint while the welding was in progress. It was suspected that because of the large diameter of the line and the difference in gravity of air and gas that a negative pressure occurred at the bottom of the line even though a positive pressure was indicated by gas burning from the top.

The Southern California Gas Co. has been using this procedure on smaller diameter lines for many years without an accident. Because of the accident on the 60-in. compressor line, it was felt that this procedure might not be safe for pipe as large as this. Therefore, an investigation of the procedure was undertaken with the object of insuring its safety for use on all sizes of pipe.

The investigation was directed toward finding answers to the following questions:

1. How rapidly and how much air enters the end

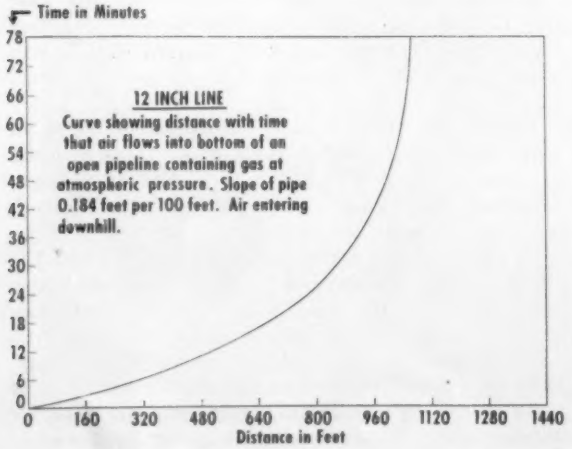


Figure 1

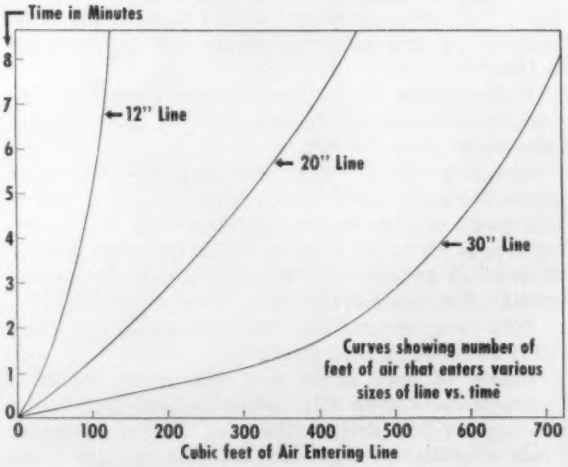


Figure 2

of a pipeline opened to the atmosphere?

2. How should air be purged from a pipeline and its absence confirmed?

3. Does unconsumed oxygen enter a pipeline from an oxy-acetylene torch during a cutting operation?

4. How much air enters a pipeline at a joint during cutting or welding using the controlled fire procedure?

5. If the air entering a joint during controlled fire welding mixes with gas and an explosion results, what condition is the welder exposed to?

6. What means should be used to prevent air from entering a joint during controlled fire welding and cutting?

The tests that were conducted to answer these questions and the results obtained will be discussed in the order listed above.

• Air entering an open pipeline

If a tube closed at one end and filled with a light fluid is immersed in a heavier immiscible fluid, the following will happen depending on the position of the tube. For any position of the tube with the closed end at the same level or at a lower level than the open end, all of the light fluid will be displaced from the tube by the heavier fluid. For any position of the tube with the closed end at a higher level than the open end, the heavier fluid will run back into the bottom of the tube to a point where the difference in elevation at this point and the bottom of the open end of the tube is equal to the diameter of the tube. This can be expressed by the simple formula:

$$L = \frac{D}{S}$$

Where:

L = The distance the heavier fluid runs into the tube.

D = The inside diameter of the tube in the same units.

S = Change in elevation of the tube per unit length.

If gases are the fluids and the case is a pipeline containing a combustible gas lighter than air, open at one end to the air, the same relations generally hold with this exception. Gas and air are miscible and can mix together by diffusion or a stirring action. Therefore, for a long length of open line being horizontal or sloping downward from the open end, the air would not completely displace the gas. This is because the front of air flowing along the bottom of the line would mix gradually with gas, and the flow of the air in and the gas out of the line would cease when mixing formed a transition zone from pure gas to pure air. At this equilibrium state there would be no gravity difference to cause flowing of the two gases.

The distance that air will run into a long horizontal line or line sloping downward from the open end is mainly a function of the diameter of the pipe, the difference in gravity of the air and gas, and the degree of line slope. The distance will increase with diameter, difference in gravity, and degree of slope.

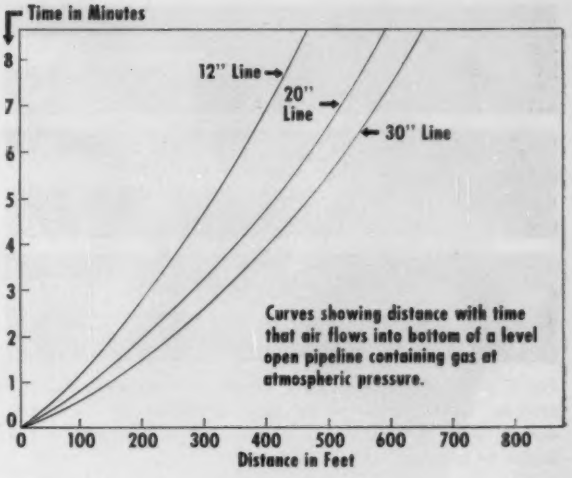


Figure 3

One test was made to determine how far air would flow into a gas-filled 12-in. pipeline. The test section was 812 ft long and had a slope of 0.184 ft per 100 ft with the open end high. The results are graphed in *Fig. 1*. The section was not long enough to complete the test and the air reached the closed end. However, the rate that the air was moving when it reached the end was very low and the curve in *Fig. 1* is extrapolated to show that the flow would have practically ceased at about 1050 ft.

Another test was made with a 102-ft section of 12-in. line elevated to a slope of about 1.75 per 100 ft with the open end low. In this case the air flowed to a point where the difference in elevation of the line at this point and bottom of the open end was equal approximately to the diameter of the pipe.

In cutting into a pipeline to make a tie-in, it is of interest to know how much air enters the line during the short time it is open to the atmosphere during the tie-in operations. Experimentally this was determined for pipelines of various diameters as a function of the

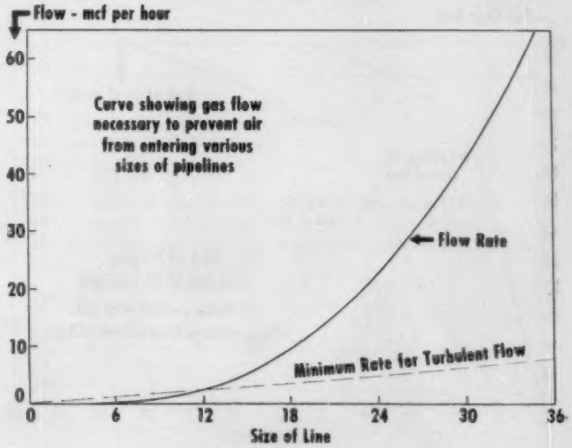


Figure 4

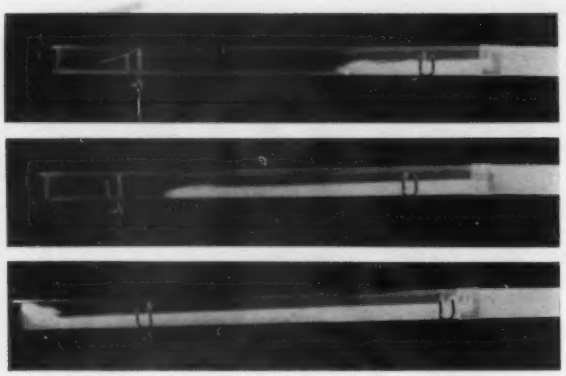


Fig. 5. Top photo shows entry of air after approximately 0.5 seconds. Center: entry of air after approximately 1.0 second. Bottom: entry of air after reaching end of the line. Note how it begins to build up against the dead end.

time the pipe was open. In these tests the pipe sections were horizontal and the gravity of the gas was 0.650. *Fig. 2* is a graph of the results obtained. *Fig. 3* is a graph showing how far the air entered the pipe section as a function of time. These curves show that air enters an open line very rapidly, the rate increasing as the diameter of the pipe increases. The significance of this is that even with the utmost care in making a tie-in, where the line is only open momentarily, a hazardous volume of air will enter the line.

It is sometimes customary to maintain a flow of gas from the open ends of a pipeline when it is opened to the atmosphere to make a tie-in. The object in this case is to prevent air from entering the line. Tests were conducted to determine what the gas flow rates would have to be to keep air from entering various sizes of pipe. *Fig. 4* is a graph showing the results obtained. It will be noted that except for pipe sizes under 12-in., the flow of gas required is too large to be safely discharged, and it can be concluded that for large diameter pipelines that the practice of drifting gas to keep out air is not practical.

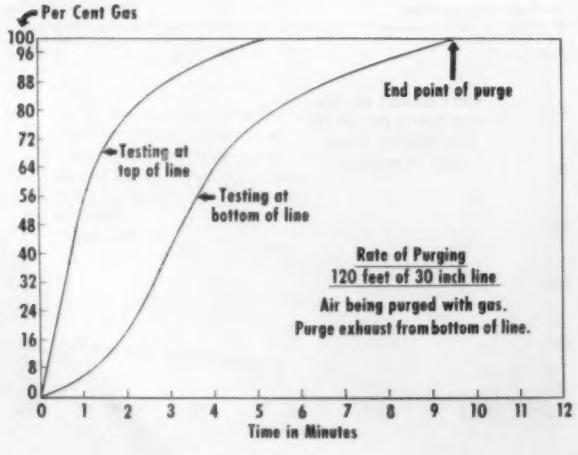


Figure 6

• Purging air from a pipeline

From what has been said before, it is apparent that during a tie-in operation even with care air will rapidly enter an open pipeline. It is, therefore, necessary before any welding is done to purge out this air and check for its absence by a reliable test.

Air entering an open pipeline flows along the bottom, in a wedge shape and occupies approximately 35 per cent of the volume of the line to the point it has reached. *Fig. 5* illustrates this condition, showing smoke-laden air flowing into an open glass tube filled with gas. Therefore, when possible, air should be purged from a bottom opening. The presence of air should always be tested for at the bottom of the pipe. *Fig 6* shows the results of both bottom and top testing on a typical line completely filled with air at the start. In this case tests at the top would indicate the line was air free in about five minutes, when actually it would not be completely air free for about 10 minutes (shown by the curve for bottom testing).

During a tie-in, the amount of air entering the pipe can be minimized by the following procedures:

1. All new sections which are to be tied-in should be previously purged of air, filled with gas, and capped.
2. When a pipe is to be opened to the atmosphere, the open end should immediately be covered by some appropriate closure.
3. All cuts or open joints in the pipe should be mudded or taped as soon as they are made.

The air which still gets into the pipe by observing the above practices should be purged before any welding is done. This can be most effectively accomplished by purging to a final joint where both ends of the pipe are covered with a plate or canvas. By opening the covering at the bottom of the pipe, the air at the bottom can be displaced by "drifting in" gas, from either direction. Confirmation of the completeness of purging should be determined by testing the issuing gas from the bottom of the pipe with a reliable combustible gas indicator or suitable gravitometer. The instrument used should show essentially 100 per cent gas.

• Does oxy-acetylene torch cutting introduce oxygen

The possibility has been suggested that in cutting a gas-filled pipeline with an oxy-acetylene torch unconsumed oxygen from the torch might be injected into the pipe to mix with the gas and cause an explosion. To investigate this possibility the following test was made. A 20-in. piece of pipe containing natural gas was cut with an oxy-acetylene torch. A larger tip and more oxygen pressure than normal was used. As the cut was made it was progressively sealed off with "mud" to prevent atmospheric air from entering the pipe. Samples of gas from within the pipe in the vicinity of cutting were taken during the time of cutting and tested for the presence of oxygen. Only a negligible concentration of oxygen was found in any of these samples.

• Air entering a pipe during cutting or welding

A series of tests was made to determine if air would enter a pipeline during the operations below:

1. Oxy-acetylene cutting of a pipe containing air-

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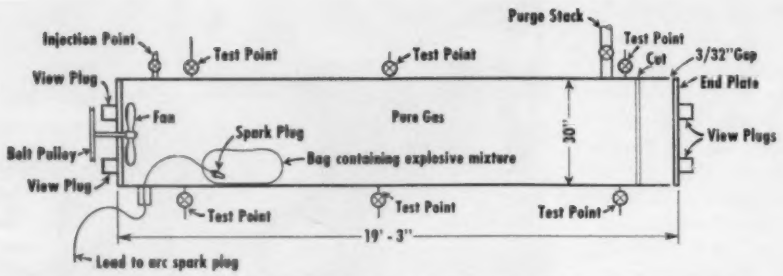

Figure 7

free natural gas. No effort was made to seal the cut as it was made. However, as large a flame as the welder could work near was allowed to burn from the cut. After the cut was made, it was taped.

2. Butt-welding of two sections of pipe. The joint to be welded was first taped and the pipe filled with air-free gas. The tape was removed from the joint, at the same time maintaining a flame burning from the joint as large as the welder could work near. The joint was then welded.

3. The same test was made as in No. 2 except that a wedding band type of joint was made.

In these tests a 19-ft length of 30-in. pipe was used. The ends were closed and a fan was used to mix the gases in the pipe to obtain a uniform mixture. *Fig. 7* shows this test section. After completion of the above operations, any air getting to the pipe was mixed thoroughly with the gas. Samples of the gas mixture were taken and analyzed for oxygen and the volumes of air entering the pipe calculated. The results obtained are given below:

Operation	Cu Ft of Air Entering Pipe
Cutting	19
Welding butt joint	8
Welding wedding band joint	12

It is probable that in performing the above operations the volumes of air entering a pipe would increase with pipe diameter.

With fire burning from a joint, gas pressures were measured inside the pipe at the top and bottom. It was found that with a flame as large as a welder could work near, the pressure was about 0.01 in. wc at the top of the pipe and below atmospheric at the bottom. In order to have a positive pressure at both the bottom and top of the pipe, it was necessary to have a pressure greater than 0.02 in. wc at the top. This gave a flame much larger than a welder could work near. *Fig. 8* shows flame height versus line pressure in a 30-in. line.

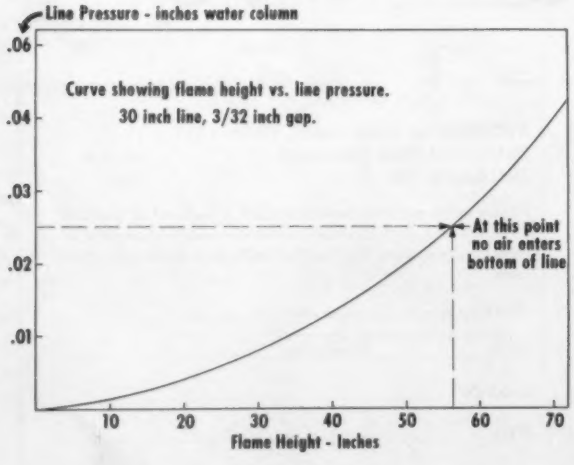

Figure 8

Fig. 9 and 10 show the flame conditions observed where the pressures within the pipe are not sufficient to keep air from entering at the bottom. *Fig. 9* shows a flame burning inside the pipe consuming all of the air entering. *Fig. 10* shows two flames burning inside the pipe on either side of a section of the joint where air is entering in too large a quantity to be burned.

It can be concluded that if flames are observed burning outside the bottom of the pipe no air is entering the pipe. However, if the flame is not burning at the bottom, air is entering the pipe and may or may not be burned on the inside.

Another test was made using the same test section with a butt joint having a 3/32-in. gap. This joint was left open to the air for various lengths of time with various gas pressures in the section at the top of the joint. The results of this test are graphed in *Fig. 11*.

• Explosions of air-gas mixtures in a pipe

It has been shown that a considerable quantity of air can enter a pipe during controlled fire cutting or welding. What happens if this air mixes with gas to form an explosive mixture and the mixture is ignited? To answer this question, a series of explosions were set off in a 20-ft section of 30-in. pipe. The section was provided with a simulated butt joint with about a 3/32-in. gap. The gas and air to be exploded in the pipe were mixed in a large plastic bag. A spark plug was placed in the bag to ignite the mixture. The plastic bag was inserted in the pipe, and the pipe filled with an air-free gas. Sufficient gas pressure was maintained inside the pipe so that air could not enter at the joint. The gas discharged from the joint was burned.

The tests were started using 5 cu ft of gas-air mixture despite the fact shown previously that as much as 19 cu ft of air entered a pipe during controlled fire cutting. The explosion in this case produced a huge massive rolling flame in the vicinity of the joint which completely engulfed a wooden dummy welder. The explosion produced an instantaneous pressure inside the pipe of about 2 psig. It was obvious from the scorching of the coveralls on the dummy that a welder working

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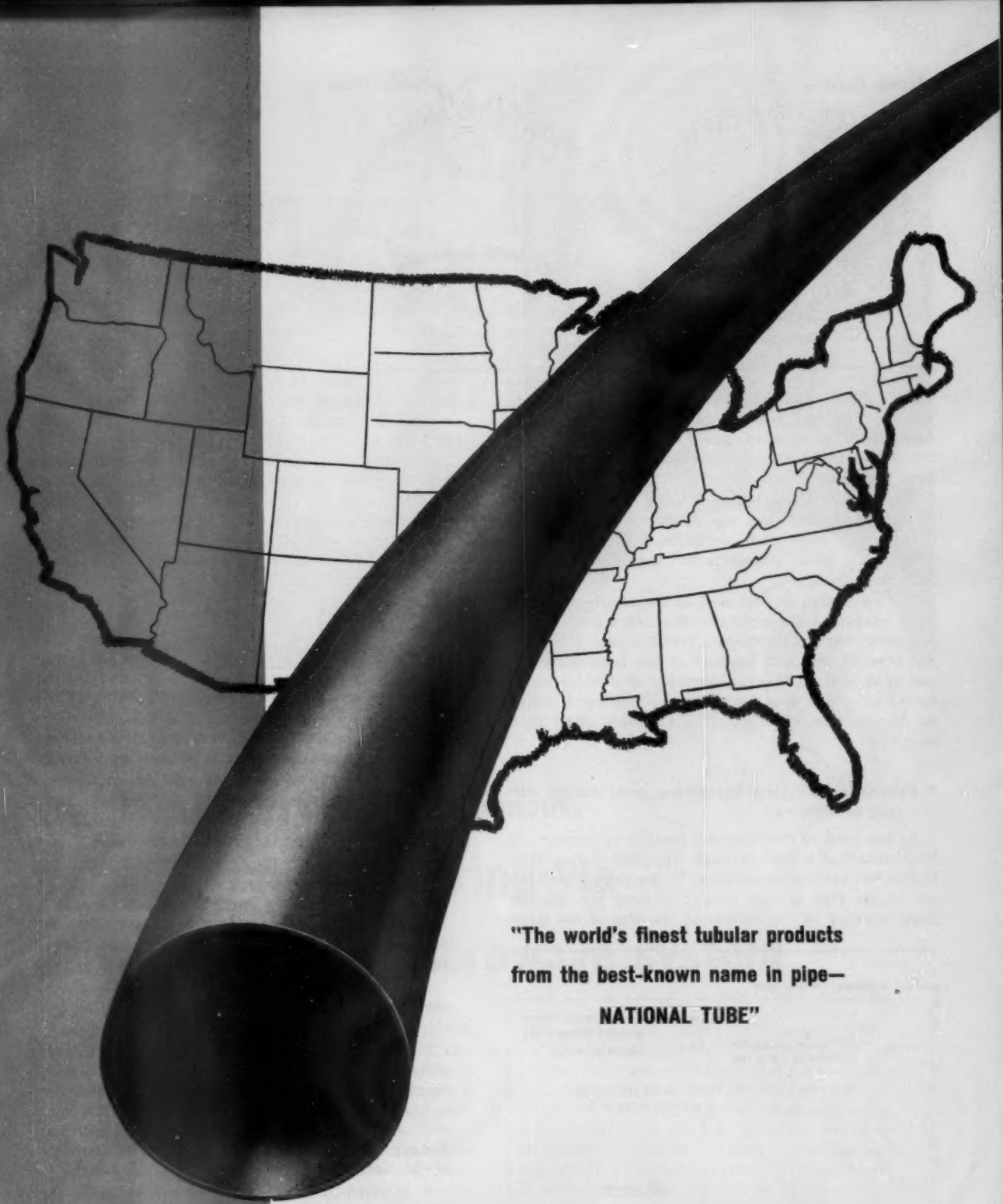

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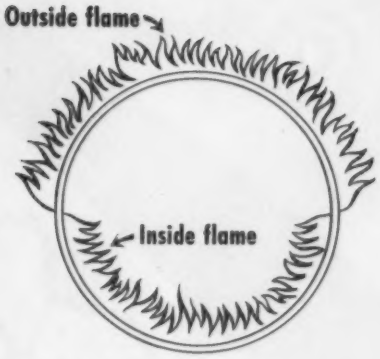


Figure 9 (left)
Figure 10 (right)

under these conditions would have been severely burned. The test section was above ground so the flames were not confined; under typical conditions with the welder in a bell hole the situation would probably have been even worse.

The severity of the explosion using 5 cu ft of gas-air mixture precluded the use of larger amounts, but several tests were made using lesser amounts of air. Even 1 cu ft of gas-air mixture produced a very hazardous condition.

The short test section used in the above tests may have intensified the explosive effect. In a long line an explosion may not produce as high a pressure to force gas through the joint because of the freedom of the gas to expand. In this case possibly the welder would not be subjected to as hazardous a condition. It would be desirable to investigate the explosive effect in a long line.

• Preventing air from entering a joint during cutting or welding

As has been shown, it is not possible to prevent air from entering a pipe through the joint during controlled fire cutting or welding. If the pressure of the gas in the pipe is high enough to keep air out, the flame burning on the outside of the pipe is too large for the welder to work near. It, therefore, appears that the only feasible way of keeping air from entering the joint is to seal it by some suitable means.

In cutting into a pipe air can effectively be prevented from entering the pipe by progressively "mudding" the joint as the cut is made and maintaining a slight positive gas pressure. A joint to be welded should be taped, such as with a masking tape, and while maintaining a slight positive gas pressure in the pipe, the weld made as the tape is burned off.

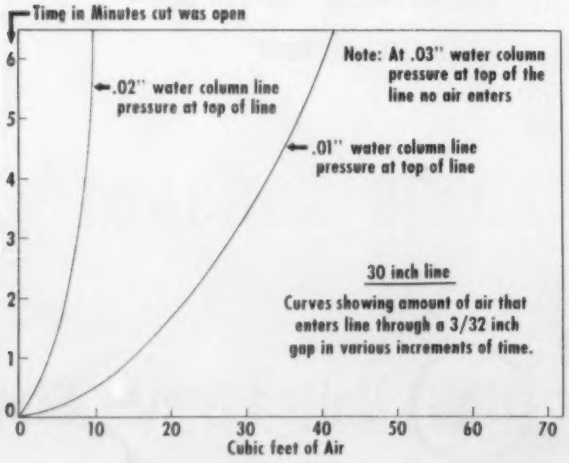


Figure 11

• Summary

1. If a gas-filled pipeline is opened to the atmosphere, air runs into the pipe very rapidly. During a tie-in operation, even momentary opening of the line will allow enough air to run in to be hazardous if welding is done. Therefore, the air should be purged out with gas before welding is undertaken.

2. The practice of "drifting gas" out of an open end large diameter pipeline to prevent air from entering is not effective. It requires a flow of gas much larger than would be safe to discharge.

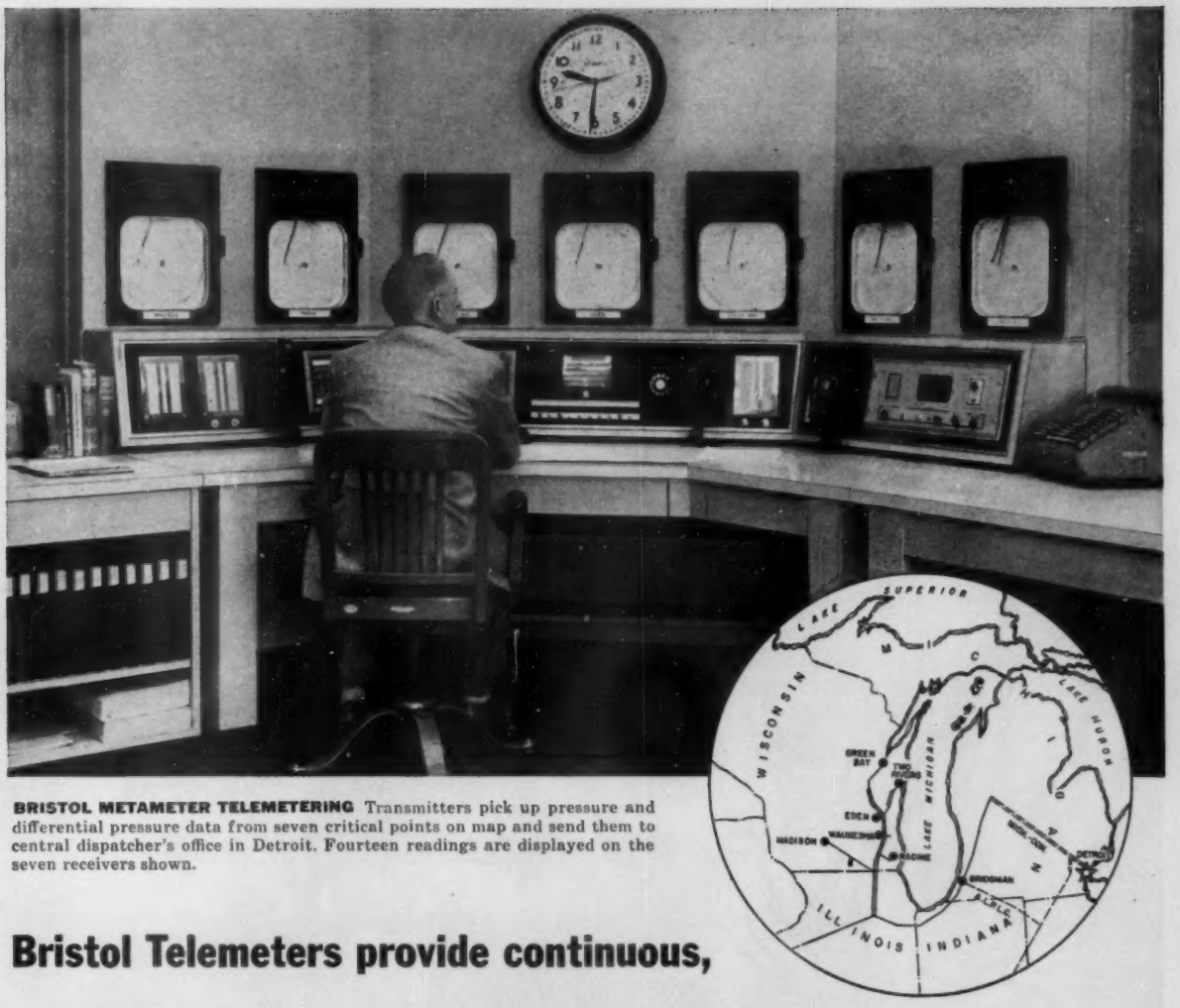
3. Because air running into a gas-filled pipeline flows and stratifies along the bottom of the pipe, it can be most effectively purged with gas through a bottom opening. It is essential to be sure that air is absent after purging by testing a gas sample taken from the bottom of the pipe.

4. Cutting into a gas-filled pipe with an oxy-acetylene torch does not inject unconsumed oxygen into the pipe from the torch.

5. In controlled fire cutting or welding on large pipe, the size of the flame burning from the joint required to keep out air is too large for the welder to work near. The amount of air that enters the joint with a flame of tolerable height, if mixed with gas and exploded in the pipe, could cause serious burning of the welder.

6. In order to keep air out of a pipe, using the controlled fire cutting or welding procedure, it is essential in the case of cutting, to progressively "mud" behind the cut as it is made and in the case of welding to tape the joint, burning off the tape as the weld is made. ■

This article was adapted from a paper presented by the authors at the PCGA Accident Prevention Conference April 30-May 1, 1958, at Tucson, Ariz., and the PCGA Transmission Conference May 6-7, at San Diego, Calif.



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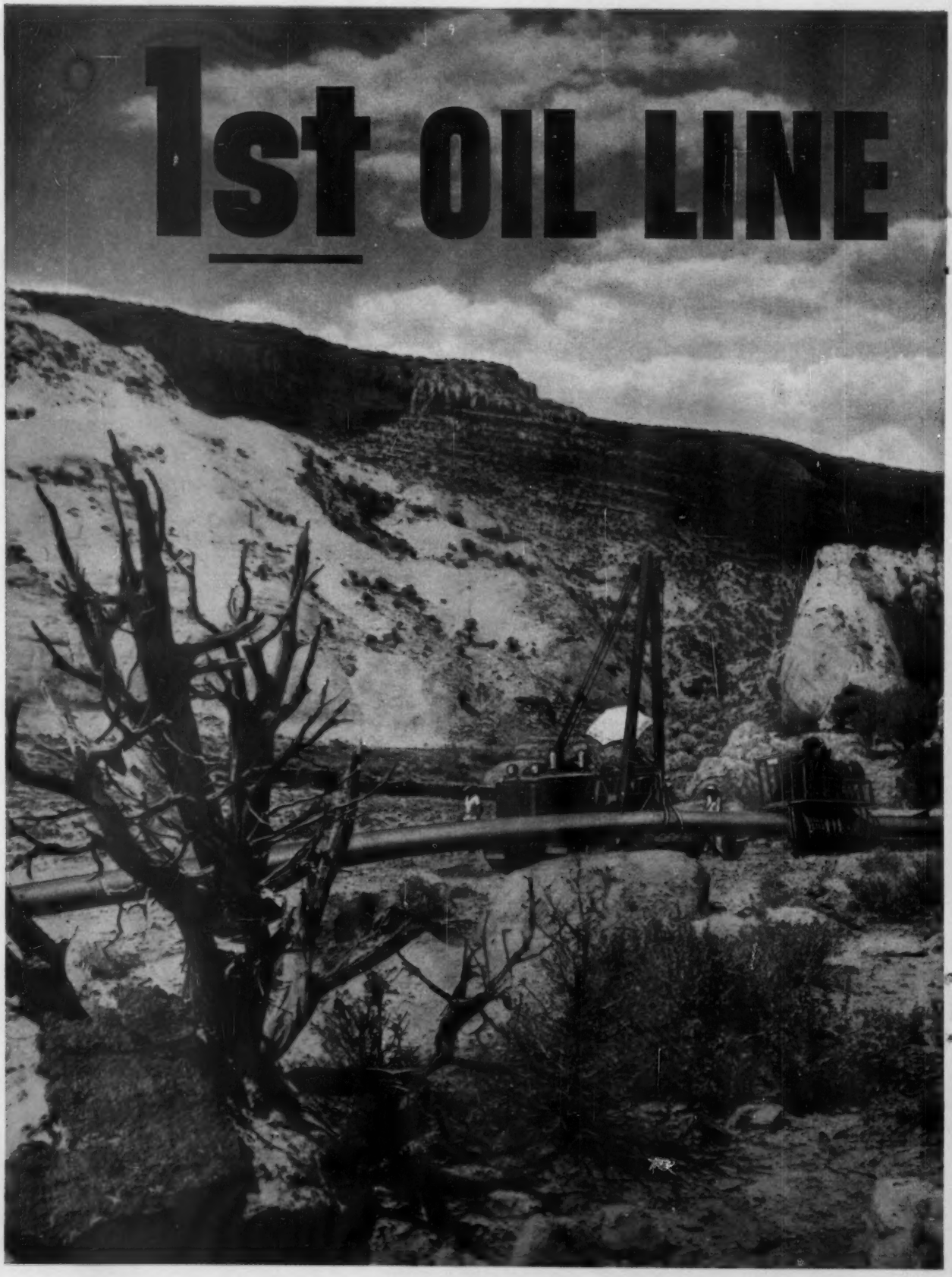
BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS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TO CALIFORNIA

The Four Corners Pipe Line is the first line ever built to supply California refineries with oil from outside the state

Shell Pipe Line Corporation, acting as agent for the Four Corners Pipe Line Company, designed, constructed and will operate this important 16-inch line. The line itself will be owned by six companies — Continental Pipe Line Company... Gulf Oil Corporation... Richfield Oil Corporation... Shell Oil Company... Standard Oil Company of California... and Superior Oil Company.

The purpose of the line is to tap reserves of 250 to 500 million bbls. to meet anticipated expansion in California's economy.

A. O. Smith furnished more than 600 of the 637 miles of 16-inch main line that runs from Aneth, Utah, to Los Angeles.

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From Aneth, Utah, to metropolitan Los Angeles, the line surmounts many obstacles. They include—elevations ranging from sea level to 6700 feet . . . deserts . . . three major river crossings . . . 200 miles of solid rock . . . and daily temperatures fluctuating between 40 and 120° F.

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Atlantic Seaboard pressure tests old 20-in. pipeline

By WILLIAM W. CLARK, Eastern Editor

Line plug, custom built by Atlantic Seaboard pipeliners at Rockville, Md., is swung into position for insertion in 20-in. pipeline.

A PRESSURE test, preparatory to pressure upgrading, was recently completed on one of the oldest long-distance transmission lines in the East—Atlantic Seaboard Corp.'s 20-in. coupled mainline—without a hitch and with no loss of service to the utilities it supplies. Results: Excellent.

The line, which is 27 years old, was once the sole means of transportation for gas produced in Kentucky fields and delivered to Washington, D. C. That was back in the days when Washington Gas Light was using natural for enrichment only. The line also supplied Manufacturers Light & Heat Co., Pittsburgh, through a tie-in near Oxford, on the southern border of Pennsylvania.

With the advent of the "Toughest Inch," a 26-in. line that was roller-coastered over the rugged West Virginia mountains several years ago, the old 20-in. was relegated to a secondary, though still important, role. Washington, Baltimore, and Richmond had adopted natural as a base gas, and the bulk of their requirements was being supplied through the 26-in.

Meanwhile, steadily increasing demands for gas had wrought some changes in the 20-in. Additional compressor stations along much of its length had boosted pressure to the 425 psi design specification, except for some 80 miles at the terminal end.

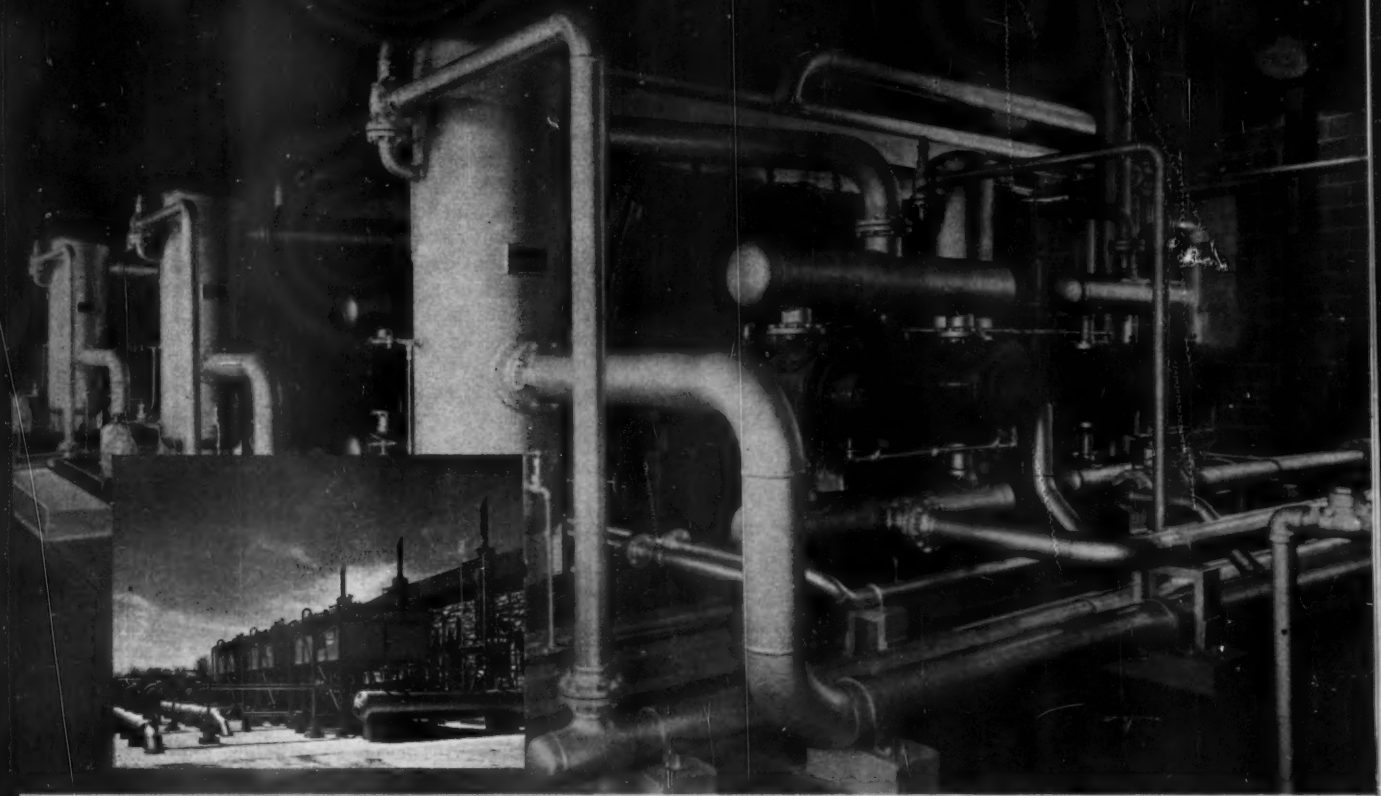
Now, the distributing companies were needing additional volumes. These could be supplied through the 20-in., because the 26-in. ties into it at Dranesville, Va., a few miles west of Washington, and pressures up to 600 psi are available there. However, until the tests were undertaken, this gas had been reduced to 375 psi.

The problem, then, was to boost pressure downstream to the 425 psi design. This meant that pressure test was necessary, in accordance with both the B31.1 code and the even more rigorous manual of approved procedures published by the Columbia Gas System, Atlantic's parent. Both authorities require that where a line has not been operated up to design pressure, it cannot be raised to that pressure without first being tested.

In all, 22 miles of line had to undergo the test. Much of it lies in sparsely settled territories which fall into the "cross-country" classification, and here gas tests at 1.1 times its operating pressure suffice. But three 1-mile segments lie in more heavily populated areas which qualify as Class 2, and here the code requires that an air test be made at 1.25 times the operating pressure.

Before tackling the exacting job of plugging off sections, purging them, and running the air tests,

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Horizontal radiators are cooled by hydraulic motor driven fans powered by pumps V-belted to sheaves on the end of each engine crankshaft.

Laclede Gas Company's Gas Storage Project—equipped with three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors. Units have Young radiators with gas, lubricating oil and engine water cooling sections. Other Beaird compressors from 120 to 660 h.p.

PACKAGED COMPRESSORS STORE WINTER'S RESERVE GAS SUPPLY FOR ST. LOUIS

IN ONE of the largest and most successful projects of its type, Laclede Gas Company of St. Louis is pumping billions of cubic feet of natural gas into sandstone that never held gas before. This additional supply will meet peak load demands enabling the company to heat additional thousands of St. Louis homes this winter.

Three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors are taking up to 16 MMcfd, delivered by pipeline from Louisiana, compressing it through two stages from 50 to 125 psi. suction to 655 psi. discharge. The gas is injected down 1400-1500 foot wells into a natural sandstone reservoir bed.

Gas interstage and after cooling is provided in sections of the horizontal radiators mounted outside the compressor building. Use of electric motors to drive auxiliary equipment has been eliminated wherever possible. Pumps for engine cooling water, lubricating oil and radiator hydraulic fan motors are all driven off the compressor.

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Section of pipe is replaced after insertion of plug on Atlantic Seaboard's 27-year-old 20-in. pipeline.

Atlantic's operating men had to determine the type of pipe in the line and its wall thickness. It was known that two types had been used somewhere in the line—one an A. O. Smith electric weld pipe with a wide seam and a .281 wall thickness, the other a National Tube seamless pipe with a .312 wall thickness. But the old field records failed to pinpoint which had been used where.

So in order to obtain this needed information, Atlantic dug 150 bell holes, an average of one every 1000 ft in the Class 1 locations, one every 500 ft in Class 2. Six weeks of digging disclosed that in the test areas, it was all .312 seamless.

Next, a line plug was needed. Atlantic designed and fabricated its own, which consisted of two 57-in. joints of grade B .312 pipe, blanked off on one end with welded end caps and joined together at the capped end with a nipple made of a 10-in. length of 16-in. pipe. This nipple gave rigidity to the plug, preventing possible separation at the coupling due to longitudinal movement in the line under test pressures.

Each length of pipe was equipped with saddle-reinforced air compressor, gauge, and blowoff connections, the latter being fitted with a deadweight connection as well. In use, indicating pressure gauges were located at each end of the section being tested and, where the source was not an end, at that source. Twenty-four-hour recording temperature and pressure gauges were also attached. These were mounted on a manifold where variations of atmospheric conditions could be held to a minimum during the test period.

Before the tests could begin, it was necessary to coordinate the dispatchers' schedules with the test procedures to make sure that Baltimore, which is served at several points from the 20-in. line, lost no gas. Three of the takeoffs, Owings Mills, Beaver Dam, and Manor Road measuring stations, are located within the test area. But gas could be run into the line either from east or west, so by confining a test to a segment lying wholly on one side or the other of a station, service could be maintained. The only difficulty encountered was the fact that Owings Mills and Manor Road are located at dead center of two of the sections. Therefore, it was necessary to split these into half-mile sections, making five test sections in all.

Here's the way the schedule set up: During the week Section No. 1 at Randallstown was to be out, the line was taken out of service between Granite station and Owings Mills, and Owings Mills, normally the downstream station, was to take gas from the east. At the same time, the half-mile Section No. 2, located west of and adjacent to Owings Mills, would be tested.

The following week, the line was to be taken out between Owings Mills and Beaver Dam station for testing of Section 3, the half-mile segment just east of Owings Mills. All of this line except for the test piece was quickly put back in service to supply a training school through a mainline tap. Then gas was supplied to Beaver Dam from the east, Owings Mills from the west (Granite station).

Sections 4 and 5, lying on either side of Manor Road measuring station, were handled in similar manner.

Gauges were carefully checked before each test began. The pressure gauges were required to be accurate within 5 psig, the temperature gauges to within 1°F. The deadweight tester used for establishing the official test pressure was calibrated to an accuracy within 0.1 psig. Temperatures were taken before and after each test with an accurate glass stem mercurial thermometer, and corrections were made in pressures where there was a variation of 0.5°F or more.

Police were notified in advance of each test, and railroad and highway crossings were manned to cope with emergencies.

Each section tested was held at the full test pressure for 24 hours. Here's a brief version of the log of a typical test (Randallstown, Section 1):

Day 1. Blowdown, Granite to Owings Mills, began at 8:15 a.m. Completed at 8.40. Between 8.47 and 11:25, sections were cut, plugs inserted and coupled. At 11:40, compressors were hooked and running. From 11:55 to 12:10, the line was purged with nitrogen. Air purge began at 12:15, was completed at 1:15, and pumping began. By 5:25 pressure reached 142 lb, air line drips were drained. At 10:11 p.m., compressors shut down again for refueling, checking oil, and draining air line drips.

Day 2. By 8:32 a.m., pressures were at 444 lb deadweight. By 12 noon, pressure was at 535 deadweight. This was reduced to 533, which was held until 12:05 noon on Day 3. At blowdown, the temperature was 66°, barometric pressure 750 mm Hg.

When all air tests had been completed, the entire line was given a gas test at 1.1 times the new operating pressure (468 psi). ■

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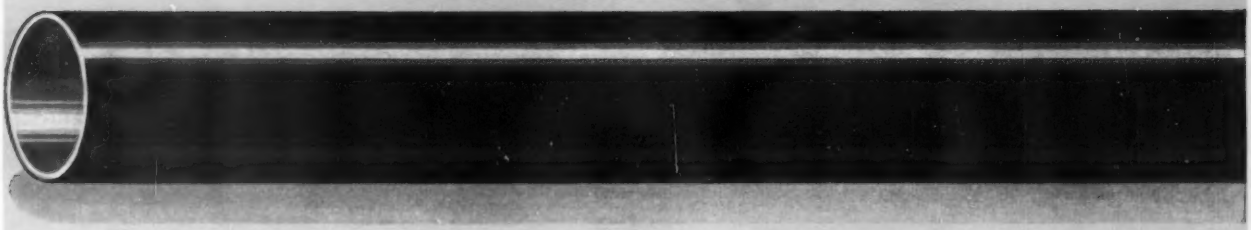

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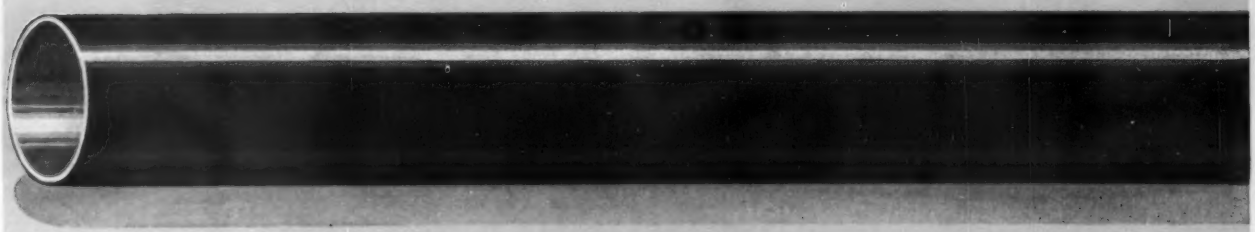
- ☐ **"BARRETT #1111" Primer** ("Barrett" Quick Drying Primer)—Especially adapted to be applied in cold weather. Use only with semi- and fully-plasticized enamels.
- ☐ **"BARRETT #1300, #1400, #1500, #1600, #1700" Primers** ("Barrett" Plasticized Primers) – Plasticized primers applied at low temperatures or at plants where temperature is controlled by ovens.



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- ☐ **"BARRETT #1180, #1190 & #1200" Enamels** ("Barrett" Pipeline Enamels) – The original Barrett Enamels. Highly resistant to soil stress effects. High in electrical insulating value! Non-absorptive, economical. Time-tested!
- ☐ **"BARRETT #1300" Enamel** ("Barrett" Millwrap Enamel) – Particularly suited for pipe in distribution systems, gathering and recycling work, mine supply and plumbers' supply, as well as dealers' stock. Supplied in metal drums weighing approximately 600 pounds each.
- ☐ **"BARRETT #1500" Enamel** ("Barrett" AA Enamel)—The all-year enamel! Plasticized enamel for external use only.
- ☐ **"BARRETT #1000" Flux** – Use with narrow-range enamels when atmospheric temperatures are low and the coated pipe is exposed above ground. Used correctly, flux will prevent checking of enamel.
- ☐ **"BARRETT #1660" Coupling Compound** ("Barrett" Waterworks Coupling Compound) – Plasticized material with plenty of flexibility. Withstands movement of pipe at couplings during lowering and after burial – without cracking!
- ☐ **"BARRETT #1700" Enamel** ("Barrett" Hotline Enamel)—A special, fully plasticized enamel having extremely high resistance to high temperatures and soil stress. Has in service temperature range from 0° to 200° F. It will not slide or move off pipe at 200° F., under actual conditions found in underground service. It is an ideal coating where operating temperatures of the lines are high, or for lines in soil exhibiting high soil stress, and in places where there is rough, stony backfill.

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GAS · PIPELINE NEWS

Justice Department charges monopoly

In unprecedented action, the Justice Department has indicted three major gas companies—American Natural Gas Co., Northern Natural Gas Co., and Peoples Gas Light & Coke Co.—on charges of conspiring to monopolize natural gas distribution in the upper Midwest against the threat of Canadian gas imports.

The indictment, returned by a Federal grand jury in Milwaukee, also named as defendants James F. Oates Jr., former board chairman of Peoples Gas; Ralph T. McElvenny, president of American Natural; and Northern's president, John F. Merriam. Named as conconspirators but not as defendants were Frank M. McMahon, president of Westcoast Transmission Co., Calgary, and Russell R. Ritchie, vice president of Stone & Webster.

The indictment stems from charges by Wisconsin Governor Vernon Thompson that the gas companies "acted collusively" to prevent Midwestern Gas Transmission Co. from building a line to bring gas from Canada into the upper Midwest.

Beginning in 1954, the indictment charges, the defendants conspired to monopolize the interstate transmission and sale of gas in Wisconsin, Minnesota, and parts of Illinois and Michigan.

Major new supply heads for California markets

Transwestern Pipeline Co.'s 1305 - mile line will move 350 MMcf/day into California from the producing areas of west Texas and the Texas-Oklahoma panhandle (see May *GAS*, Highlights, p. 8).

Transwestern's sole customer will be Pacific Lighting Gas Supply Co., which will pick up the gas at the California-Arizona border and sell it to Southern California and Southern Counties Gas companies (see story below).

John R. McMillan, Transwestern's president, said his company eventually expects to increase its installed compressor hp from 52,000 (initially required) to 125,000 hp to accommodate a future demand for 640 MMcf/day. Pacific will have the right of first refusal of the added supply.

For the 670 miles of its mainline from Roswell, N. M., to Topock, the company will use 30-in. pipe. Two main 24-in. laterals will converge at Roswell.

In addition to reserves already committed, Transwestern has contracted for gas in the Aneth field of Paradox basin in the San Juan basin, Mr. McMillan said. He indicated, however, that the route and size of the Four Corners lateral extending north from Gallup will be determined when additional reserves have been committed.

Six automatically operated, engine-driven rotary compressor stations will dot the length of the pipeline.

Pacific Lighting plans new California line

The California Public Utilities Commission has on file Pacific Lighting Gas Supply Co.'s plan to build a 128-mile, 34-in. gas line from the California-Arizona border near Topock to Newberry, Calif.

Gas Supply president, Robert A. Hornby, said the line will tie in with the 1300-mile line proposed by Transwestern Pipeline Co., Houston. Gas Supply will sell the gas to Southern California and Southern Counties Gas companies.

In addition to the pipeline, Gas Supply proposes to build a compressor station near Needles to push the gas across the state to the coastal population centers.

Estimated cost of the California project is $21 million.

El Paso gets new gas supply in New Mexico

Sales of gas to El Paso (Texas) Natural Gas Co. from the Blanco-Mesaverde and Aztec - Pictured Cliffs gas fields in San Juan county, N. M., have been authorized (Docket G-12181).

The decision authorized several producers to sell gas to Southern Union Gathering Co., Dallas, for resale to El Paso. Southern Union will make sales at the wellhead of 88 wells in the two gas fields. Southern Union previously was delivering all of the gas from the 88 wells to its parent, Southern Union Gas Co. However, production from part of the wells is subject to the prorating orders of the New Mexico Oil Conservation Commission. The examiner pointed out that El Paso takes gas on a substantially higher annual load factor basis than that on which Southern Union is able to use gas in serving its own New Mexico market areas. He said that the purpose of the new sales is to achieve substantial equalization in the fields of these two essentially disparate loads.

The gathering company will deliver the gas at an annual rate of about 29 billion cu ft, or 80 MMcf/day, during the years 1958-1960.

Natural Gas Storage will boost Herscher capacity

Natural Gas Storage Co. of Illinois wants to develop additional natural gas storage facilities near Herscher, Ill. Under its recent FPC application, the company will develop the Mt. Simon underground formation for storage.

Last year, Natural Gas Storage extensively tested the Mt. Simon stratum, lying 2450 ft underground and 600 ft below the Galesville formation, existing storage reservoir.

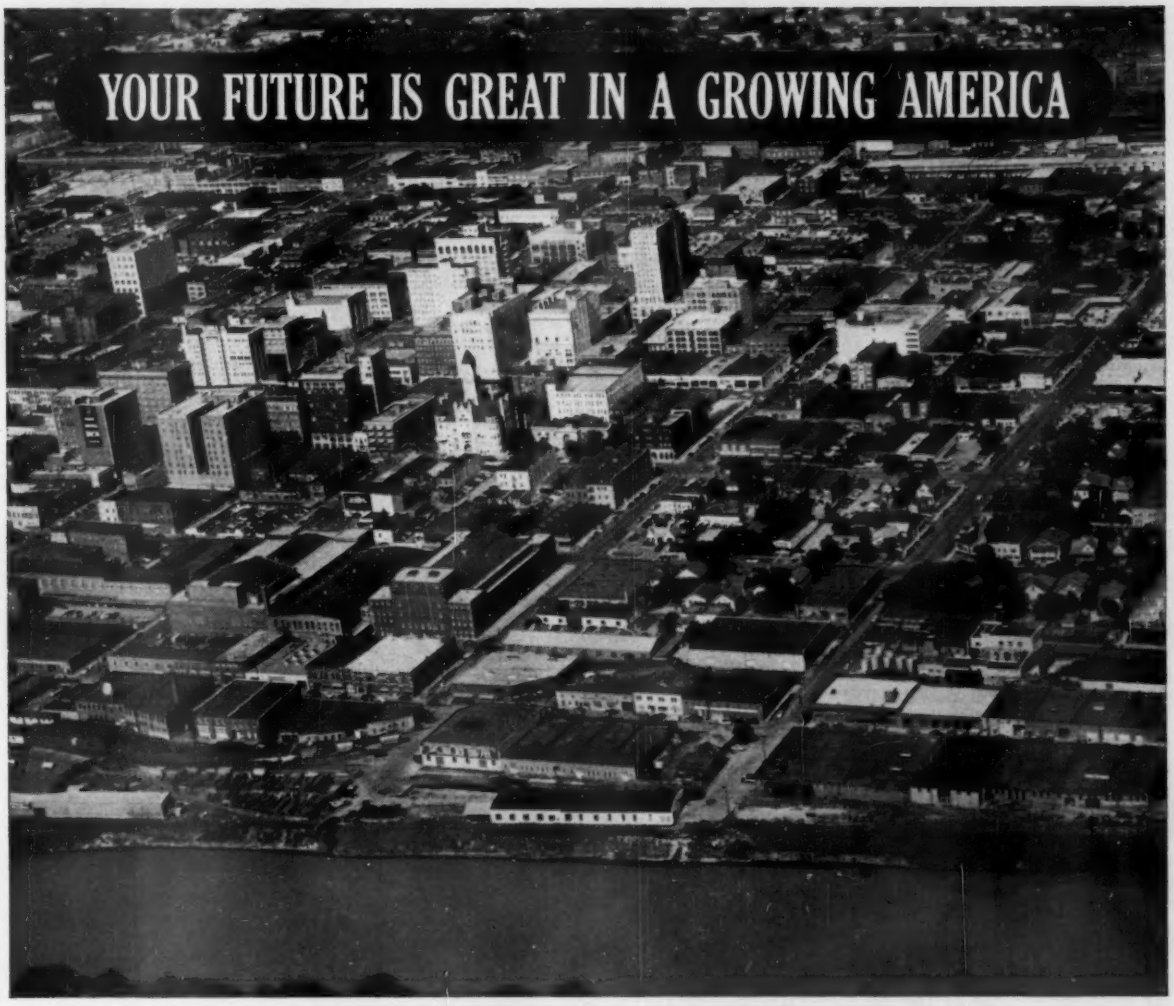
Plans call for construction of a gathering system, addition of a 1330-hp compressor for gas injection and withdrawal, and drilling of three observation wells. Estimated cost of the job is about $2.5 million.

Natural Gas Storage believes, from testing and other data, the total Herscher storage capacity in the Mt. Simon formation — upon full development—may be greater than the Galesville reservoir is at present.

Northern proposes 50 MMcf/day increase

A system increase of more than 50 MMcf/day is proposed by Northern Natural Gas Co., Omaha, in a new application filed with the FPC. This latest increase will raise Northern's total capacity to 1.3 billion cu ft/day.

Proposed in the application is construction of about 57 miles of 30-in. mainline loop together with four miles of 10-in. branch line



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4. **More production** . . . U. S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.
5. **More savings** . . . Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.
6. **More research** . . . *$10 billion* spent each year will pay off in more jobs, better living, whole new industries.
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(This space contributed as a public service by this magazine.)

additions and compressor horsepower additions totaling 8000. Cost is estimated to be about $7.7 million.

FPC okays Southern's southern Louisiana plan

The FPC has approved Southern Natural Gas Co.'s plan to obtain additional gas supplies in southern Louisiana (Docket G-13082 et al).

The Birmingham-based transmission company will build 360 miles of line, 4310 hp in compressor capacity and about 23 measuring stations for $39.7 million.

Also issued at this time are 11 certificates to independent producers authorizing them to make sales from Louisiana fields. Gas reserves to be acquired, including certain small volumes not yet dedicated by contracts but represented as being probable, are estimated at 1,042,553,000 cu ft.

Southern said the facilities, together with others recently authorized, would increase its south Louisiana supply by some 298 MMcf/day.

The commission said that the 22.8-cent/Mcf initial price to be paid by Southern will be among the highest for any gas produced in the southern Louisiana area. In view of this fact, the FPC will institute investigations to determine the reasonableness of the producers' rates.

Panhandle must sell gas to Northern Illinois

Despite Panhandle Eastern Pipe Line Co.'s opposition, an FPC presiding examiner has directed Panhandle to sell additional gas to Illinois Power Co., Decatur, Ill. (Docket G-12298).

Presiding Examiner Kelley ordered Panhandle to supply Illinois with a maximum of 640 MMcf/day to meet requirements of the Village of Ridge Farm, Ill.

Panhandle opposed the proposed service, stating that its system did not have sufficient peak-day mainline capacity to render the new service and at the same time meeting all of its existing peak-day obigations. The presiding examiner stated that the FPC in an order issued Jan. 22, 1958 "very definitely fixed . . . the extent of Panhandle's total peak-day mainline capacity."

Texas Illinois increasing compressor horsepower

A $3.9 million expansion project proposed by Texas Illinois Natural Gas Pipeline Co. will bring an additional 20 MMcf/day to the company's market area in Illinois, Missouri, and northern Indiana by the end of the year.

The company's plan, filed with the FPC recently (Docket G-14829), will increase the daily deliverability capacity of its system from 504 MMcf to 524.

To do this, Texas Illinois will install one additional 2000-hp compressor engine at eight of its 11 compressor stations in Lufkin and Marshall, Texas; Texarkana, Malvern, Searcy, and Biggers, Ark.; Jackson, Mo.; and Hammond, Ill.

Northern's long-standing Canadian plan dismissed

Three long-pending applications by Northern Natural Gas Co. relating to the proposed import of gas from Canada have been dismissed by an FPC presiding examiner (Dockets G-4259, et al). At the same time, the examiner okayed pipeline projects by two other companies which would provide delivery of an additional 75 MMcf/day to Northern.

The examiner said that since no evidence had been offered, the applications must "of necessity" be dismissed. Involved are requests for a certificate authorizing construction of new pipeline facilities in North Dakota and Minnesota to move gas imported from Canada; a permit to establish a connection on the U. S.-Canadian border for the importation of about 100 MMcf/day; and authorization to import the gas. The original filings were made in October 1954.

Approved applications involve projects by Permian Basin Pipeline Co. and El Paso Natural Gas Co. Permian would make the 75 MMcf/day available to Northern by delivering it to El Paso at its Plains compressor station in Yoakum county, Texas. This would be in exchange for an equivalent volume delivered by El Paso to Northern at El Paso's Dumas compressor station in Moore county, Texas. El Paso also was authorized to deliver gas to Pioneer Natural Gas Co., Amarillo, on an off-peak basis for Northern's account.

The five applications disposed of previously were consolidated by the FPC for hearings involving the midwestern U. S. (Midwestern Transmission, etc.). The examiner said that regardless of the eventual disposition to be made of the other 15 applications, the five can be disposed of now without prejudice to the rest.

Five-company approval issued by FPC

Three pipeline companies and two independent producers have FPC authorization for plans which will result in larger deliveries to customers of the pipelines (Dockets G-12571, et al).

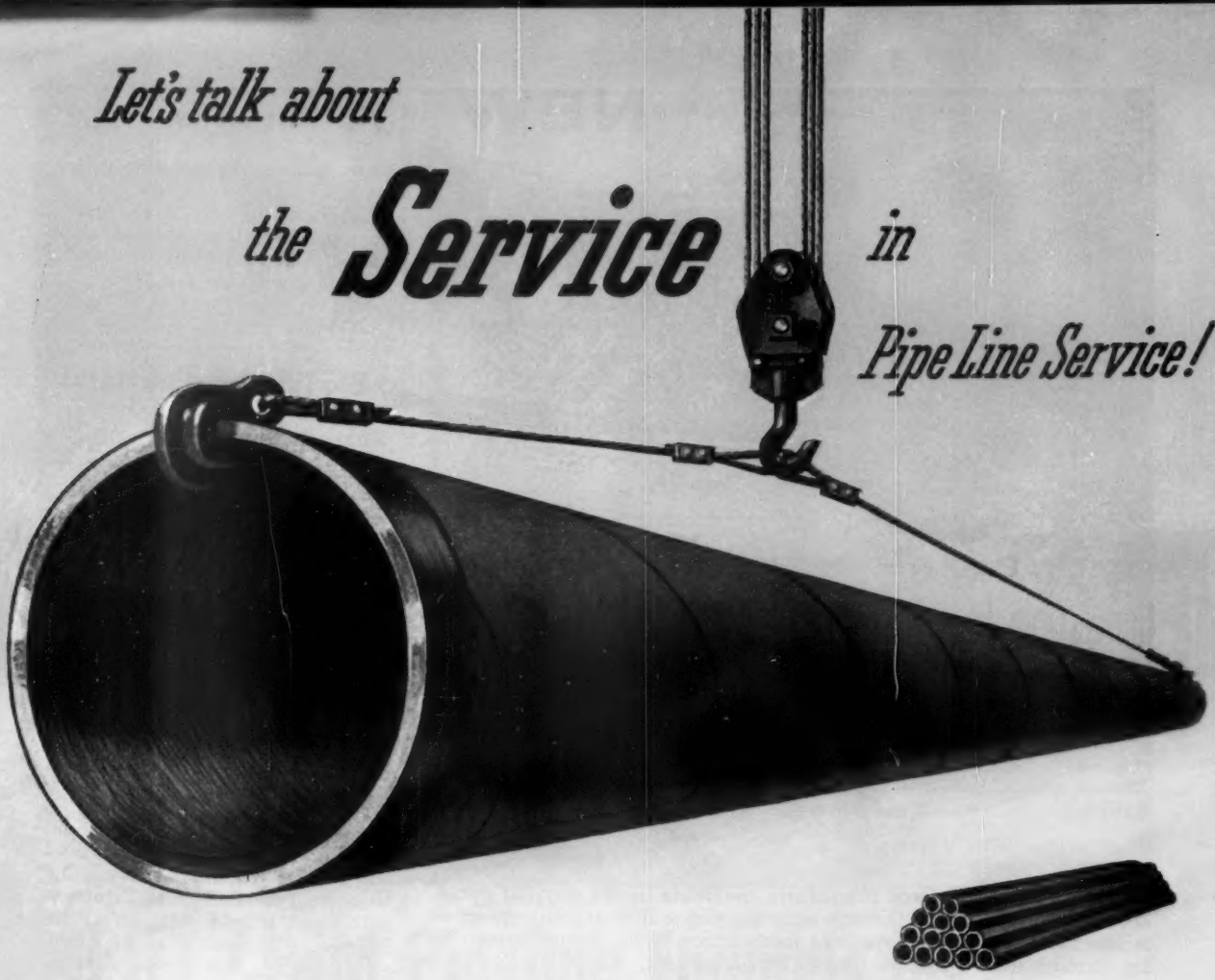
United Fuel Gas Co., Charleston, W. Va., will build a line from its Rockport compressor station in Wood county, W. Va., to a point of interconnection with Hope Natural Gas Co.'s facilities in Wirt county, W. Va. Atlantic Seaboard Corp., also of Charleston, will build a mainline tap, interconncting its existing system with Hope Natural in the Blackwater anticline field. Hope's facilities include field lines and a measuring station to enable it to sell gas to Atlantic and deliver exchange gas to Atlantic for United's account. United will return equivalent quantities of exchange gas to Hope at the proposed interconnection.

Under the proposed arrangement, Atlantic will receive up to 90 MMcf-day from Hope, 40.5 million of which will be bought from Hope, with the remainder for United's account. Atlantic will pay Hope 27 cents/Mcf of purchased gas and will pay United for the remainder at the rates contained in United's contract demand rate schedule — a demand charge of $1.65/Mcf and a commodity charge of 27.42 cents/Mcf.

Commenting on the proposed rates, the commission said the only question posed by the case was that of what evidence a producer must introduce in order to sustain a finding "that the public convenience and necessity requires a sale of the gas."

The commission declared that if the applicant proves there is a market for the gas at the proposed price and that the project is economically feasible at that price, "it has sustained its burden of going forward with the evidence, and in the absence of evidence showing that the proposed price or rate adversely affect the public convenience and necessity, the applicant has made out a *prima facie*

Let's talk about the **Service** *in Pipe Line Service!*



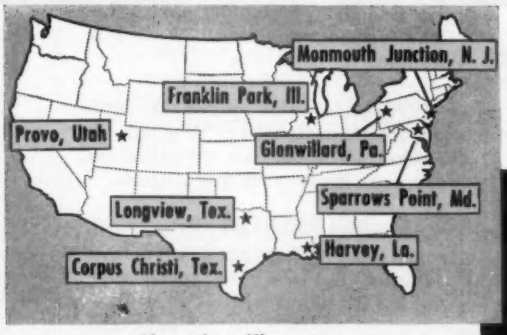
A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe *at no cost to you* . . . plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity. You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!



Also sales offices at

Atlanta, Georgia — Lincoln, Nebraska
Tulsa, Oklahoma — Houston, Texas

PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

NEW

NEW NEW NEW

Convertible ½-yd. Hydrohoe-Hydroshovel-Hydrocrane

New all-hydraulic H-5 Hydrohoe-Hydroshovel combines high production with traditional Hydrocrane mobility, flexibility

You asked for it — here it is! Real production digging, yards and yards of it, fast . . . a total of 90 hydraulic horsepower at your command. Dipper reversed, it's a powerful swing loader and it's convertible to crane, clamshell, auger, etc. It's the all-new H-5 Hydrohoe-Hydroshovel!

NEW DIFFERENTIAL VALVE LETS YOU SELECT SPEED OR FORCE

Optional *speed* and *force* ranges are available in the digging cycle. That means you can cut through easy digging with maximum speed — or use the optional, higher-range force action (with slower speed) to dig through frozen ground, tough clay, coral, etc.

NEW PUSH-BUTTON SELECTOR VALVES STEER POWER WHERE IT'S NEEDED

Selector valve buttons on the control levers let you concentrate horsepower where you need it when you want it. Operator can double the speed of any motion at the touch of a button.

NEW COMBINATION OF RAM FORCES EXCEEDS 90 TONS

189,000 pounds of ram force combined in crowd-down, dig, and wrist actions. Combination of wrist action and telescoping boom provides more favorable dumping ranges (and cleaner dumps) both in tight and at maximum reaches.

PLUS ALL THESE FEATURES

Specialized boom telescope action — four hydraulic outriggers — low-cost carrier — up to 50 mph on open roads — all-hydraulic controls — short tail swing — four sizes of dippers. 245H58

BUCYRUS ERIE *A Familiar Sign at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

See your Bucyrus-Erie distributor or send coupon for full details about the new ½-yd. H-5 Hydrohoe-Hydroshovel — tops for high-speed digging . . . big production digging . . . tricky digging.

BUCYRUS-ERIE CO., South Milwaukee, Wisconsin
Gentlemen:
Please send me complete details on the new H-5 Hydrohoe ☐
Name
Company
Address
City State
245H58

pipeline news • *Cont'd.*

case, and a certificate should issue to it."

At least two court cases support this position, the commission declared, stating that it was unable to find any contrary authority.

GAS • Pipeline Notes

Recent FPC action

Texas Gas Transmission Corp., Owensboro, Ky. in Docket G-14514 seeks a $3 million budget-type authorization for new gas facilities. The company plans would enable it to take into its system gas it may purchase from independent producers in the general area of its system.

Texas Eastern Transmission Corp. (Docket G-12446) was authorized to build 59 miles of 30-in. and 22 miles of 14-in., together with 141,780 hp additions in existing stations and a new 2200-hp compressor station in Louisiana, Mississippi, Pennsylvania, Ohio, Kentucky, and Tennessee. Estimated cost: $37.4 million. At the same time its Penn-Jersey affiliate was authorized to add 4000 hp at its Delmont, Pa. station and to construct five new compressor stations in Pennsylvania totaling 67,000 hp. Estimated cost: $11.1 million.

United Fuel Gas Co., Charleston, W. Va., was given the go-ahead on its plan (Docket G-13058) to deliver gas at wholesale to Ohio Valley Gas Co. for resale in communities near Portsmouth, Ohio. United Fuel will abandon all retail distribution of gas in Ohio with the exception of an industrial sale to Detroit Steel Co.

Trunkline Gas Co., Houston, seeks approval (Docket G-14704) of its plan to build two 24-in. crossings of the Red river in Rapides parish, La. The crossing would cost about $1.7 million.

Trunkline also plans a budget-type construction program in Docket G-14365. No mainline increase is involved in the project.

Michigan Gas Storage Co., Jackson, has a temporary permit (Docket G-14465) to spend $3.9 million on new facilities in central

Continued on page 128

From the day we produce them . . .

. . . till the day you apply them . . .

PITT CHEM Pipeline Enamels are Backed by a 4-Way Service Program

ON line after line, in all types of terrain and soil, tough, durable *Pitt Chem* Coal Tar Enamels have *proved* their superior ability to provide sure, economical pipeline protection—year after year. But there's *another* big reason why so many companies specify *Pitt Chem* Pipeline Enamels. And that's Pittsburgh's Four-Way service program:

1. Complete Quality Control As a basic producer, Pittsburgh maintains rigid quality control standards at every step of enamel production, from coal to finished coating.

2. Written Specifications Published to guarantee you consistently superior quality and performance from every drum of *Pitt Chem* Pipeline Enamels —in application and in service.

3. Experienced Sales Service *Pitt Chem* sales representatives are experienced coating men. They talk your language, will help you plan the many requirements of your coating job.

4. Technical Service Pittsburgh maintains a full time staff of field service men to work with your field men in the efficient, economical application of coattings. *Write us about your protection requirements!*

★ PITT CHEM Pipeline Enamels
★ PITT CHEM Coal Tar Coatings
★ PITT CHEM Insul-Mastic Coatings

WSW 8855

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

HAMMARLUND COC

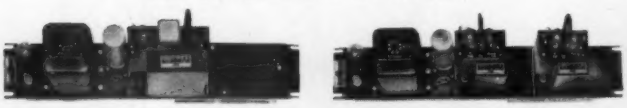
(Centralized Operations Control)

Hammarlund COC is a real profit-builder! It cuts costs in processing, transmission, and distribution of gas, as proved by leading gas companies and pipelines from coast-to-coast, and overseas.

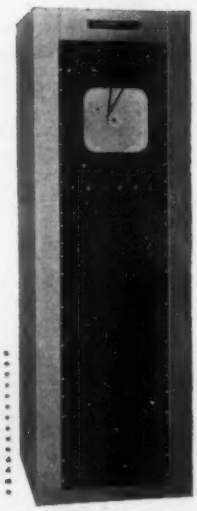
Hammarlund COC equipment is standard, off-the-shelf assemblies that are easy to install, simple to maintain, and completely reliable. COC systems are capable of handling all telemetering and remote control from a single location, whether two stations or ten, one function or one thousand functions. It may be used with any standard carrier, either telephone wire, or radio link.

It will pay you to investigate Hammarlund COC right now. Write for complete COC manual . . .

Tone signaling transmitters and receivers.



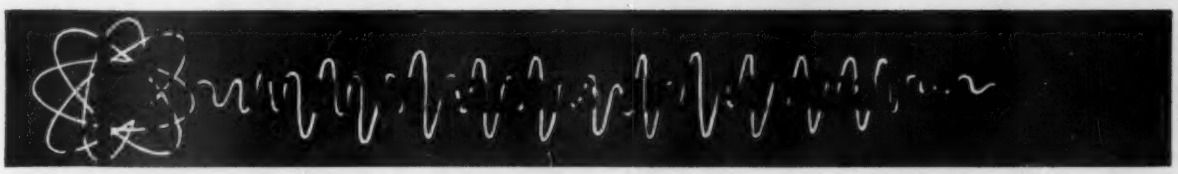
Pulse generating and counting equipment.



Pulse Width Selection systems for handling greater number of functions.

HAMMARLUND MANUFACTURING COMPANY, INC.

Established 1910 ***460 West 34th Street, New York 1, N. Y.***



Edited by FRANK CHAPMAN

Loss through default

By F. VINTON LONG

SEVERAL months ago the writer met with other members of the communications committee of the American Gas Association, and at that time we made a recommendation which was included in the minutes of the meeting that were sent to the steering committee of the AGA. The recommendation was this: "That the name *Communications Committee* be changed to *Communication and Telecontrol Committee.*" The reason for this change in title was brought on by the writer's firm conviction that there is no one better qualified to exercise the art of cybernetics in telecontrol than the communications engineers of the pipelines. It is a "natural" for these men. If they do not supply their intellect, intelligence and diligence to fill in the vacuum which is presently involved, it's their own darn fault. I believe that it is about time that the communication engineers of the pipeline industry realize that they are not working for communication companies and the common carrier telephone companies; these engineers are working for companies in which communications is not the important product.

Communications is something which is used to save money for gas companies, but the communications department of any pipeline company has not, is not, and will never be, in the eyes of management, a profit producing division of the company. Because of this it is most important that the communication engineer in the gas industry accept this fact and bring out to management that efficient company operations are impossible without communications.

And right there is where the art of cybernetics and telecontrol comes into the picture. It is definite now that without telecontrol of pipelines maximum efficiency will not be experienced. The company which refuses to face this fact is sooner or later going to pay the penalty.

There is no man better equipped to bring forth for management efficiently, cheaply, effectively, and without error the plan for telecontrol engineering of an automatic pipeline than the communications engineers of the company concerned.

But for some reason these communications experts have been most retiring. They have been retiring to the point that they are practically nonexistent in management conferences concerning automation of pipelines.

It may be that in some companies we are uninvited and cannot attend the conference. But I must suspect that in many cases the communications engineers involved are really not interested. They are involved too much in the nuts, bolts, tubes and transistors of the communication system involved. We fail to realize that we have a mission to perform for the activation of an automatic pipeline.

There is another definite trend toward loss through default. That is the attitude of some of the microwave equipment suppliers, particularly in the 6000 megacycle and above band who at this time seem to have just about given up any thoughts for a firm future for the sale of their equipment to the pipeline industry.

More and more of these suppliers are going into 60 channel, 120 channel, and 240 channel equipment. Which of course is perfect for the common carriers but is seldom indicated for the pipeline industry.

There are two ways for these suppliers to go. One is to make a simple transistorized battery-operated link for the pipeline industry consisting of one or two audio type channels; and, the other way is to concentrate on the heavy density common carrier links.

I believe that those suppliers who wish to go the heavy density route should make up their minds that they will find little application in the pipeline business.

The pipeline industry requires only a few channels. The use of voice channels is indeed a luxury for the pipeline industry. The only practical use at all for private communications in pipeline operations for telecontrol, and telecontrol can usually be accomplished with only a few audio type channels.

There has been too much talking and too little telemetering on most of the pipeline communication systems that have been installed.

There is one exception to this statement, and that is in the case of line breaks or other emergencies where no amount of mechanical gadgets or electronic controls will replace the knowledge and experience of a pipeliner.

If for reasons of uninterrupted service and reliability, which is a very important point, the pipeline installs its own microwave system, then this talking can be done on a very cheap basis. This means that if private microwave is installed for reasons of telecontrol and reliability, then the extra channels for talking can be had for a cost of practically nothing. But talking for talkings' sake is not at all feasible and economical. You can do the whole thing better with meters, lights and push buttons in the operation of a pipeline. ■

pipeline news • *Cont'd.*

from page 124

Michigan. To be built: About 40 miles of 26-in. line from a point in Gratiot county to Isabella county and 25 new wells in the Winter and Cranberry Lake storage fields. The new facilities are needed to meet increasing requirements of Michigan's sole customer, Consumers Power Co.

Transcontinental Gas Pipe Line Corp., Houston, got FPC's greenlight on its plan to construct and operate facilities to receive gas purchased in the Pleasanton and South Pleasanton areas of Atascosa county, Texas. At a cost of $705,000, Transco will build about 23 miles of 6- and 8-in. purchase lateral lines and four purchase meter stations.

Southern Natural Gas Co., Birmingham, will build about 12 miles of line and a measuring station to enable it to receive gas produced in the Tantine field in Plaquemines parish, La. (Docket G-13864, et al). Estimated cost: $886,510.

Kentucky Gas Transmission Corp., Charleston, W. Va., was authorized (Docket G-13667) to construct about 20 miles of 26-in. line paralleling its existing lines. The new facilities will increase the design capacity by 32.8 MMcf/day.

Gulf Interstate Gas Co., Houston, has approval of its plan (Docket G-13648) to spend about $2 million on new facilities that will enable it to take gas from United Fuel Gas Co. United will buy the gas from producers in the general area of Gulf Interstate's system for redelivery at Means and Leach, Ky.

Manufacturers Light & Heat Co., Pittsburgh, got approval of its Docket G-12155 calling for construction of about 21 miles of various sized pipe, a 16-in. river crossing, and a metering and regulating station to serve an industrial customer in Ohio.

Lone Star Gas Co., Dallas, won approval of its plan to construct storage facilities in the Ambassador field, Clay county, Texas. Lone Star will spend about $740,900. The working storage capacity of the field will be about 1.6 billion cu ft, with an injection rate of 6 MMcf/day and a withdrawal rate of 50 MMcf/day.

GAS Pipeline People

FRED M. ODOM JR. has been elected a director of United Gas Pipe Line Co., Shreveport. He has been a vice president of United Gas Corp. and subsidiary companies since early 1957.

FRANK P. SONNENBERG has been named chief geologist and PAUL D. BALBIN is chief geophysicist for Chaco Petroleum, S. A., Bolivian subsidiary of Tennessee Gas Transmission Co.

PAUL M. CRANDALL has been promoted to the post of comptroller of La Gloria Oil & Gas Co., affiliate of Texas Eastern Transmission Corp.

R. F. FRED KLEIN is now manager of lubricated plug valve sales for Walworth Co., New York. Prior to his appointment, Mr. Klein was a sales engineer in the company's metropolitan division.

DR. WILLIAM W. MALLORY has joined Ball Associates, oil and gas consultants, to specialize in exploration for oil and gas in the Rocky Mountain region.

H. S. MARSHALL is executive vice president and W. E. HAMMOND and T. R. HALSTEAD are new vice presidents of the Air Preheater Corp., New York. Also, HILMER KARLSSON is assistant to the president and consulting engineer.

Motorola Communications & Electronics Inc. has promoted four men in sales-administrative posts. HARRY RONAN is manager, two-way radio sales, for the 15-state eastern area; ED VOGEL replaces Mr. Ronan as New England regional sales manager. He has been a zone manager there. Named to two new special sales posts are PAT KELLY, who is now account executive manager, eastern area, and BOB SWIFT, who is sales manager, special markets, in the Midwest.

PEARCE R. BUTTERFIELD, formerly corrosion engineer for Transcontinental Gas Pipe Line Corp., has joined the newly organized World Supply Co., Houston, as sales engineer.

FRANK T. CUNNIFF has joined Pittsburgh Coke & Chemical Co. as market research manager.

WARREN M. RAPPLEY has been appointed assistant manager, paving materials sales in the Chicago district by Barrett Division, Allied Chemical & Dye Corp.

RALPH L. REYNOLDS has been promoted to branch manager, Grove City, Pa., sales office of Cooper-Bessemer Corp., Mt. Vernon, Ohio. Mr. Reynolds fills the post formerly held by FRED W. GREEN, who has retired. Mr. Reynolds' territory is composed of western Pennsylvania and western New York. Mr. Green has retired after 20 years with Cooper-Bessemer.

Several top appointments have been made by Tennessee Gas Transmission Co., Houston. HAROLD BURROW, veteran senior vice president, is now first vice president and assistant to the president. New senior vice presidents are: C. C. JOHNSON, formerly vice president and treasurer; JOE J. KING, formerly vice president, engineering development; and W. W. WITMER, formerly

Joe J. King
Tennessee

L. W. A. Campbell
Tennessee

C. C. Johnson
Tennessee

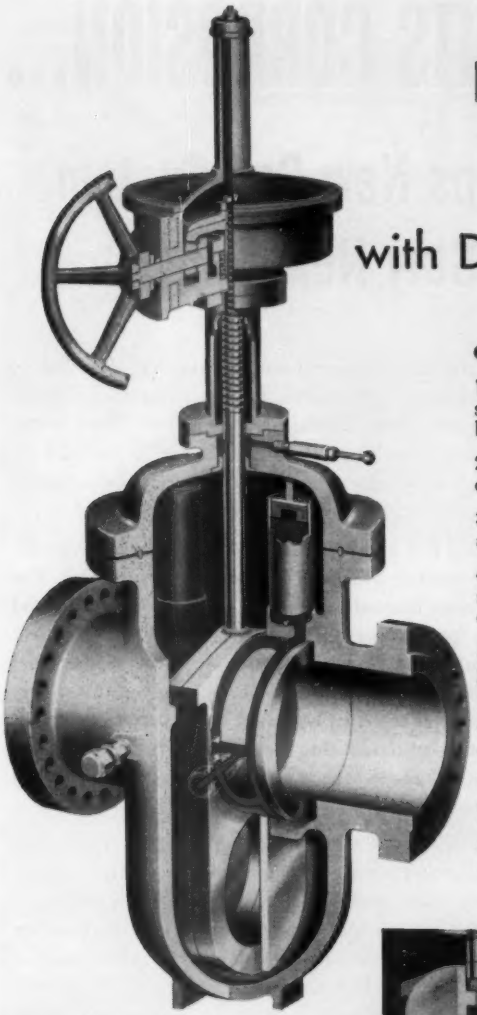
O. H. Simonds, Jr.
Tennessee

Harold Burrow
Tennessee

W. C. Braden, Jr.
Tennessee

NEW ADVANTAGES "GO ON THE LINE"

with DARLING-McEVOY Conduit Valves



Compare these features with *any* other pipe line gate valve:

1. **EVERY CLOSURE LEAK-PROOF.** No forcing. Positive automatic self-sealing under line pressure between seats and gate and between seats and body by means of sealing compound.

2. **NON-DIRECTIONAL.** Flow may be in either direction. Sealant cylinders operate independently.

3. **TWIN SEALANT RESERVOIRS.** One for each port. Sealant feeds automatically to downstream side only.

4. **NEGLIGIBLE SERVICING.** Leak-proof closure requires very little sealant. Reservoir capacity ample for 50 to 80 operations dependent on differential pressures.

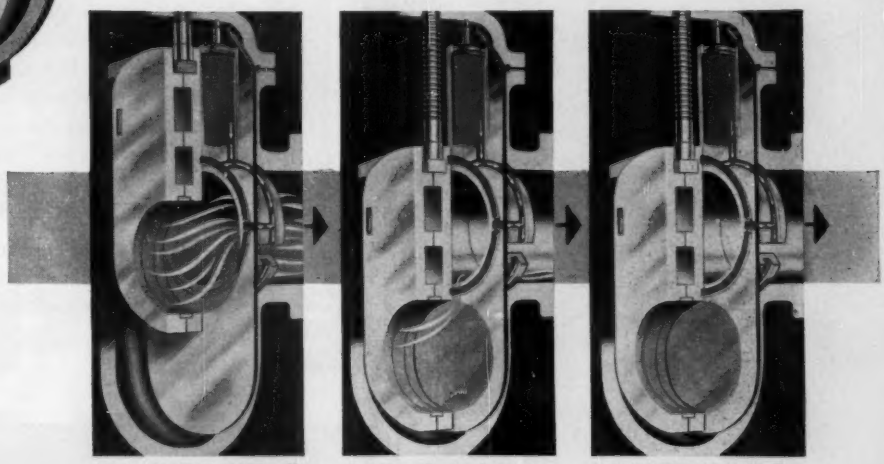
5. **SMOOTH, FULL FLOW.** No impediments. No turbulence. No pockets to collect sediment.

6. **EXCEPTIONAL PERFORMANCE AND LIFE.** Self-aligning gates. No wedging. Non-distorting seats, protected when valve is open or closed.

Darling-McEvoy conduit valves, made in 4" and larger sizes, are fully field proved and are now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

Above: *Cutaway showing heavy, self-aligning gate and parallel seat assembly, with one of the two sealing systems indicated.*

Right: *Diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED ... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED. *Pressures again in balance. Tightness established. No additional sealant used until again needed.*

DARLING VALVES

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 26, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

REPUBLIC X-TRU-COAT FIGHTS CORROSION...

Helps New Gas System Stay New Longer

When officials of Elizabethtown, Kentucky, decided to install a municipal gas system, proper protection for the buried pipe was given careful consideration. They found the ideal answer in Republic's exclusive X-TRU-COAT, the plastic-armored steel pipe designed to provide maximum protection against external corrosive attack.

X-TRU-COAT is a two-in-one unit produced by extruding a plastic coating over selected steel pipe or tubing. The pipe is first shot blasted to insure a clean surface for good adhesion. A permanent bond is assured by a special live adhesive undercoating which is *hot*-applied to the steel pipe immediately before the extrusion of the outer coating. Because it is unaffected by seasonal temperature extremes and aging, this undercoating never sets up. It retains its ability to seal accident-caused cuts in the extruded coating and prevents underfilm migration of moisture.

Republic X-TRU-COAT makes use of a new, yellow-colored, linear type polyethylene for the outer plastic armor. It combines great toughness with high chemical resistance and negligible water absorption to provide excellent service life. In addition, good flexibility permits X-TRU-COAT to be field-bent without damage. To permit welding, coating is cut back four to six inches. Completed joints are economically protected with pressure-sensitive plastic tape or cold applied joint compounds. Finally, the extruded coating weighs only one-fifth as much as ordinary wrapping, permitting savings in freight and handling costs.

X-TRU-COAT is available in a wide range of pipe- and tubing-wall thickness, and in diameters from ½" through 4" nominal size. For complete information, mail coupon.

OVER 50 MILES OF REPUBLIC X-TRU-COAT were used in this new gas system being installed to serve Elizabethtown, Kentucky. Extruded polyethylene armor assures years of trouble-free, corrosion-resistant service. Smaller photos show how plastic is cut back to permit welding. On completion of the weld, joint is wrapped with pressure-sensitive plastic tape to provide continuous protection throughout the system.

LOW-COST, CORROSION-RESISTANT SERVICE ENTRANCE LINES made up of Republic Semi-Rigid Kralastic Pipe and Tubing are gaining increasing acceptance for new and replacement use. SRK Pipe saves time and money in new connections through its low initial cost and ease of installation. Cutting is done with an ordinary handsaw. Lengths are joined with brush-applied solvent and socket-type fittings. On replacement jobs, SRK Tubing is threaded through existing line from tap to riser, eliminating costly trenching. Mail coupon for complete data.

REPUBLIC PRODUCES A COMPLETE LINE OF PIPE PRODUCTS to handle all of your transmission and distribution problems. From the largest fusion weld type to the smallest continuous weld size, all Republic Pipe provides unexcelled uniformity. As a result, when you specify Republic you can be sure of good workability plus long, trouble-free service. Types and sizes include: Electric Fusion Weld from 24" through 30" O.D.; Electric Resistance Weld from 2⅜" through 16" O.D.; and Continuous Weld from ⅛" through 4" nominal.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. GS-5865
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:

☐ X-TRU-COAT ☐ Fusion Weld Line Pipe
☐ SRK Plastic Pipe ☐ Resistance Weld Line Pipe
☐ Continuous Weld Steel Pipe

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Stanley Ward
Tennessee

Dan Williamson
Transco

Robert Kietzman
Cooper

James Caldwell
Cooper

vice president, gas supply. Newly elected vice presidents are W. C. BRADEN JR., former director of certificates; L. W. A. CAMPBELL, formerly chief engineer; O. H. SIMONDS JR., formerly director of sales; and STANLEY WARD, formerly director of taxes.

ROBERT L. KIETZMAN has been appointed a sales engineer for Cooper-Bessemer Corp.'s St. Louis branch office. He will cover the Missouri and southern Illinois areas. New district service manager, Pacific coast, for the Mt. Vernon, Ohio, company is JAMES H. CALDWELL. He will be responsible for supervision of all Cooper-Bessemer service activities in the Los Angeles, Seattle, San Francisco, and Casper (Wyo.) areas. He will headquarter in Los Angeles.

H. F. NEUMAN has been appointed sales engineer for Cooper-Bessemer of Canada Ltd. Mr. Neuman will cover the western Canadian territory, working out of Calgary, Alberta.

O. P. CARTER has been elected president of the Midwest Piping Co., St. Louis. He served as executive vice president for the past two and a half years. He succeeds ERIC A. KERBEY, who died recently.

J. E. ALLISON has been elected a vice president of Texas Gas Transmission Corp., Owensboro, Ky. Mr. Allison formerly was director of sales and customer relations for the company. In his new position he will retain the responsibility for those functions.

DAN WILLIAMSON has been elected a vice president of Transcontinental Gas Pipe Line Corp., Houston. Mr. Williamson has been manager of Transco's land department since 1953. He joined the company in 1949 as chief of acquisition.

J. O. GRANTHAM has joined Northern Natural Gas Co., Omaha, as director of personnel, a newly created post. Mr. Grantham formerly was director of industrial relations for Anderson Prichard Oil Corp. of Oklahoma City.

JOHN E. HEWSON is manager of the New York sales region of the Foxboro (Mass.) Co. He succeeds E. H. HUCKMAN, who recently assumed the post of assistant field sales manager. Replacing Mr. Hewson as manager of the Tulsa branch is D. T. MCELLIGOTT. Taking over for Mr. McElligott in the El Paso area is J. M. FLANIGAN, JR.

RANDALL T. KLEMME has joined Northern Natural Gas Co., Omaha, as director of economic research and area development. Prior to joining Northern, Mr. Klemme headed Oklahoma's Department of Commerce and Industry, which he organized in 1955.

H. F. Neuman
Cooper

Randall Klemme
Northern

J. E. Allison
Texas Gas

O. P. Carter
Midwest

J. PAT BEAIRD, president of the J. B. Beaird Co., Inc., Shreveport, La., has been elected a director of American Machine & Foundry Co., of which his firm is a subsidiary.

KENNETH W. PAUL has been named manager, lease and oil properties evaluation department of Mayflo Oil Co., Dallas.

Washington • *Cont'd.*

Continued from page 21

Pipeline Co., would parallel the rich El Paso Natural system which has held a huge chunk of the California market for some time. The new line, should it win FPC approval, would be competing with El Paso from supply fields to markets.

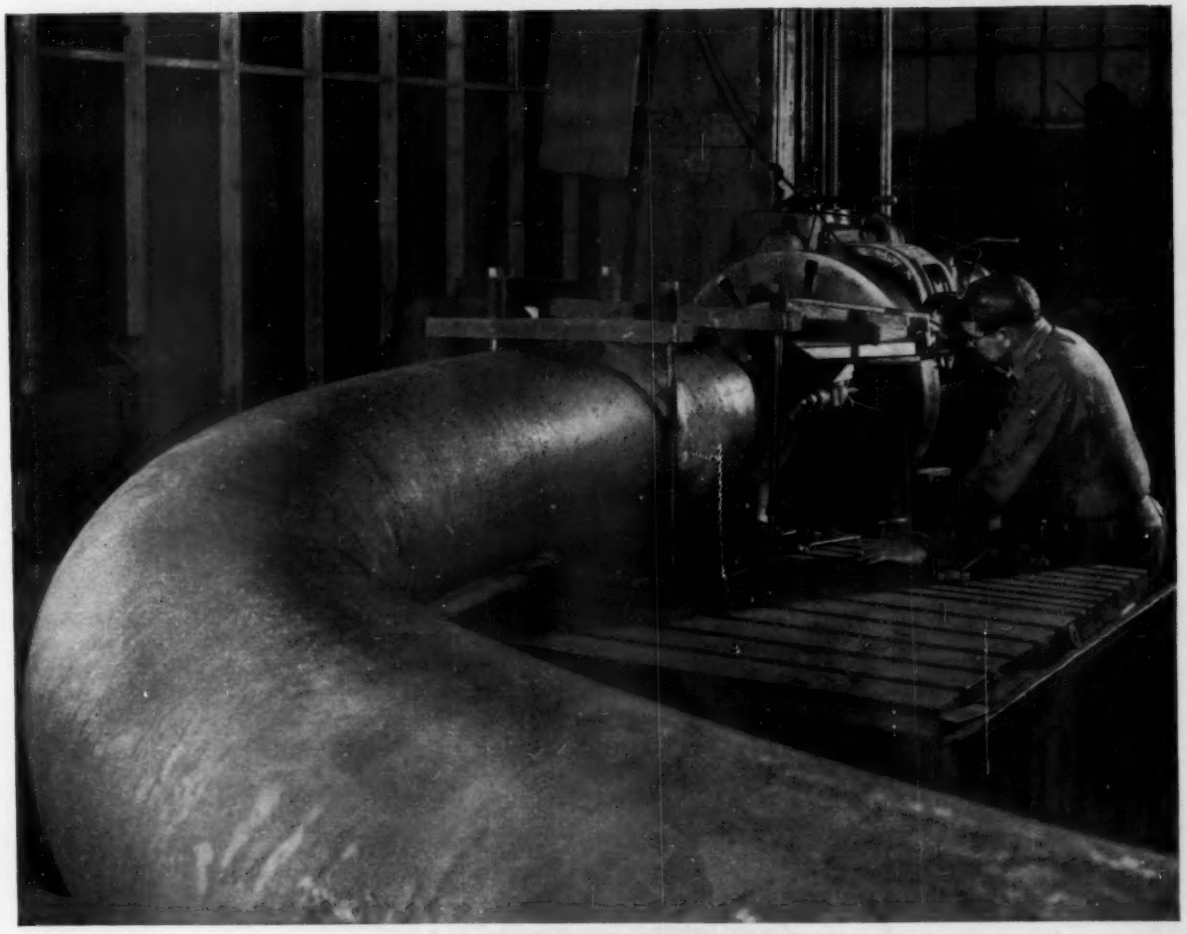
El Paso is now facing antitrust charges by the Justice Department for its merger with Pacific Northwest Pipeline Corp., which transports gas from Colorado to Washington State. The government alleged that the combination threatens to give El Paso a monopoly west of the Rocky mountains and may prevent other firms from trying to tap these markets.

If the Transwestern line is built, the monopoly charge may become a moot question, Washington attorneys say. El Paso thus is put somewhat in the middle—should it fight the competition and the antitrust suit, or accept the competition and perhaps kill the antitrust action.

Meanwhile, the present granddaddy of pipeline arguments, the proposal of Midwestern Gas Transmission and its parent, Tennessee Gas Transmission, is moving slowly toward settlement.

The proposal, with much of its opposition melted after disputing firms worked out an agreement on the southern part of the line, is now facing one serious, but not necessarily fatal, stumbing block.

FPC staff attorneys have filed briefs with the hearing examiner recommending rejection of the original plans by Midwestern as well as Natural Gas Pipeline Co. of America, Michigan Wisconsin Pipe Line Co., and Northern Natural Gas Co. None of these applica-



Boring mill cutting bevel on 18" diameter pipe with 3¼" wall in preparation for welding.

QUALITY CONTROL— key to superior performance

Dravo's Pipe Fabrication shops at Marietta, Ohio, are staffed by highly skilled men who have at their command the very latest in fabricating equipment, including a variety of devices for Quality Control checks. However, at Dravo, Quality Control goes beyond routine checks for compliance with applicable codes. Every step in the fabrication of piping is performed in accordance with procedures developed during Dravo's many years of experience, and is subject to rigid inspection.

Here are some of the Quality Control checks which assure dependable performance in Dravo piping.

1. Radiographic examination of weld. Heavy walled piping may be subjected to several such checks during welding.
2. Heat treatment for stress relieving or normalizing under controlled furnace conditions.
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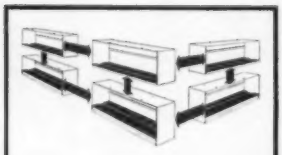
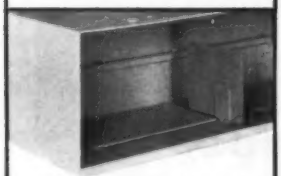


Modular Sections are quickly assembled on job without tools.



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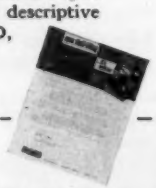

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tions meet the requirements of the Natural Gas Act, the staff attorneys contended. All involve proposed service to the Chicago and upper Midwest area.

The staff objected to the Midwestern plan as originally filed because it involves direct and firm sales to industrial customers (steel mills). The staff also argued that the lack of an assured supply of Canadian gas is a major defect in the proposal, and that it "falls substantially short of being economically feasible."

The other applications either failed to show adequate gas supplies or would result in increased rates to existing customers. The applications involve some competition for markets with the Midwestern proposal.

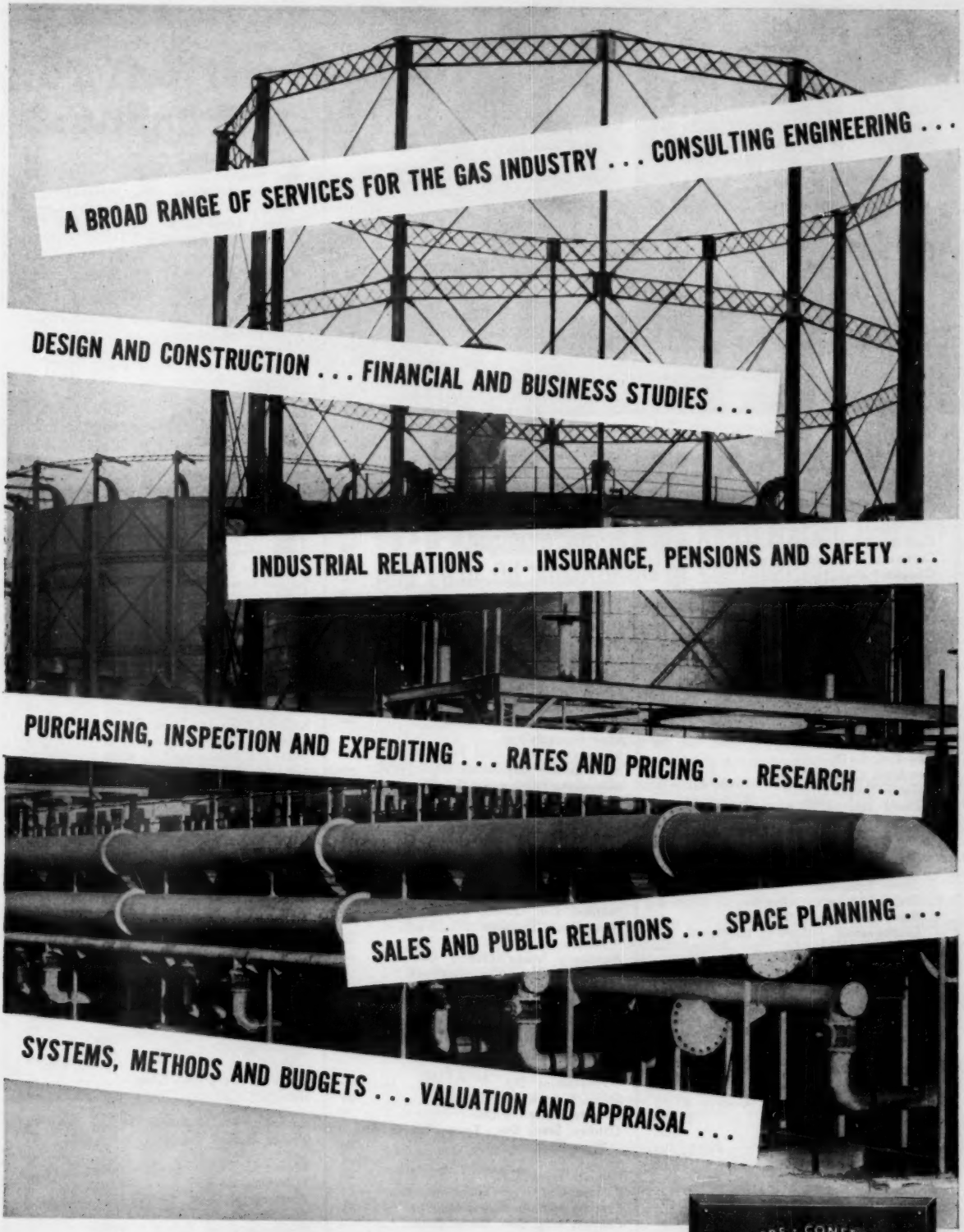
The FPC hearing examiner is not bound by the staff recommendation when deciding a case. Examiners can, and do, overrule staff recommendations.

Midwestern was hoping that its original application would be superseded anyway by the proposal submitted earlier this year involving only half the line—from Tennessee to the Chicago area. But the firm was sweating out an FPC ruling on whether it would accept the revised application. The commission ruled about a year ago that it would accept no further filings in the case.

Meanwhile, the FPC is begining to shake down the regulation of independent gas producers it still doesn't want. In one recent case, the commission clearly put the emphasis on area field prices rather than original cost in approving rate hikes for 11 independent producers.

In approving the higher rates on the basis of field prices, the commission, with Commissioner Connole dissenting, overruled a hearing examiner and the commission staff, which had contended that the rate base method must be used.

The FPC majority ruled that to use the rate base method in this case (involving sales to Cities Service Gas Co.) the commission would have had to study the Oklahoma producers' entire plant and operation in order to regulate only a fraction of their sales. ■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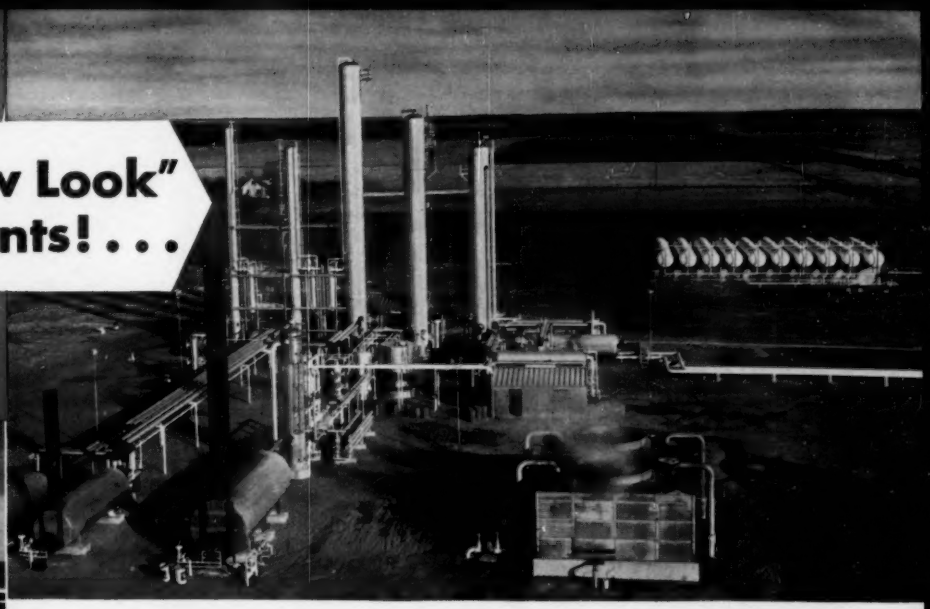

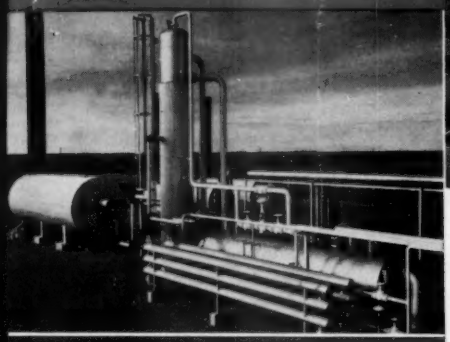

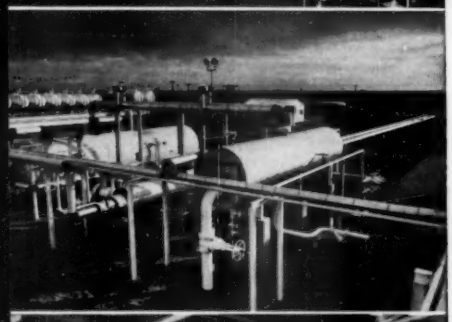

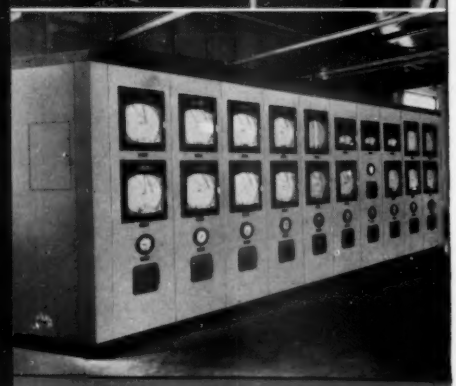

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CO_2	1.37
C_1	80.86
C_2	8.73
C_3	4.43
iC_4	0.34
NC_4	0.57
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